



IN REPLY REFER TO:

# United States Department of the Interior

## NATIONAL PARK SERVICE

Grand Canyon National Park  
P.O. Box 129  
Grand Canyon, Arizona 86023-0129

Dear Interested Party:

Reference: Construction of Employee Housing in the Village area of the South Rim of Grand Canyon National Park

Subject: Public Review of Environmental Assessment/Assessment of Effect (EA/AEF)

Enclosed is an EA/AEF for the proposed construction of 2 each 8-plexes to be made available to employees of Grand Canyon National Park. Implementation of the proposed action will provide critically needed housing in the Grand Canyon Village area, well away from the rim in an area not visible to visitors and comply with environmental laws and regulations.

If you wish to comment on this EA/AEF, you may mail your comments to the Superintendent, Grand Canyon National Park, Attention: Sara White, Environmental Compliance Officer, Grand Canyon National Park, P.O. Box 129, Grand Canyon, AZ 86023. Please be aware that names and addresses of respondents may be released if requested under the Freedom of Information act. Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. There also may be circumstances in which we would withhold from the record a respondent's identity, as allowable by law. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. We will make all submissions from organizations or business, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety. We would appreciate receiving your comments no later than **July 25, 2003**. If you have any questions regarding this project, please call Sara White at 928-638-7956. The EA/AEF is available at the following website as well: <http://www.nps.gov/grca/compliance>.

Sincerely,

Joseph F. Alston  
Superintendent  
Enclosure

# Grand Canyon

National Park Service  
U.S. Department of the Interior

Grand Canyon National Park



## Employee Housing

Environmental Assessment/Assessment of Effect

Grand Canyon National Park ■ Arizona

June 2003

## Employee Housing

### Public Comment

If you wish to comment on the Environmental Assessment/Assessment of Effect (EA/AEF), you may mail comments to the name and address below. This EA/AEF will be on public review for 30 days; comments are due by **July 25, 2003**. Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. There also may be circumstances in which we would withhold from the record a respondent's identity, as allowable by law. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. We will make available for public inspection in their entirety all submissions from organizations or businesses and those from individual s identifying themselves as representatives or officials of organizations or businesses.

#### Please Address Comments to:

Joseph F. Alston, Superintendent,  
ATTN: Sara White, Chief Environmental Compliance Officer  
Grand Canyon National Park  
P.O. Box 129  
Grand Canyon, AZ 86023

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## Executive Summary

The National Park Service (NPS) proposes construction of 2 8-plexes to be made available to employees working in Grand Canyon National Park (GRCA). The proposed activity would occur within the vicinity of Grand Canyon Village, Grand Canyon National Park, Coconino County, Arizona and would implement a portion of the *1995 General Management Plan* (GMP) for GRCA. Work would begin in summer 2003 for the housing facilities. This proposed activity is part of a comprehensive effort under the 1995 GMP to accommodate interpretive facilities and needed housing while minimizing resource impacts and conflicts.

The proposed employee housing facility would be constructed on a project site located on the east side of Mohave Street, just south of Albright Avenue and would consist of two two-story housing buildings, parking area, and associated utility and infrastructure connections. Construction of the housing units would result in ground disturbance to approximately 1.16 acres.

Mitigation measures have been designed to minimize, reduce, or eliminate impacts of the proposed actions. These mitigation measures would apply to contractor orientation, air quality, noise, water quality, exotic animals and vegetation, noxious weeds, sensitive wildlife species, blasting (if required), architectural guidelines, cultural resources, and lighting.

The environmental assessment/assessment of effect discloses the environmental impacts of the proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided should the proposed action be implemented. The impact analysis and conclusions were based on knowledge of the resources and the sites, review of existing literature and Grand Canyon National Park studies, information provided by experts within National Park Service and other agencies, and professional judgment. The no action and action alternatives were evaluated. The preferred alternative is the action alternative that would construct the new employee housing facilities.

Overall direct, indirect, and cumulative impacts to general vegetation, exotic vegetation, noxious weeds, and soils, would range from negligible to moderate in intensity, and be considered adverse short- and long-term impacts. The employee housing facility and foreseeable future developments may impact individual Northern goshawks and peregrine falcons, but are not likely to result in a trend toward federal listing of the goshawk or falcon as a threatened or endangered species or a loss of species viability.

There are expected to be direct and indirect effects on cultural resources as a consequence of the continuation of current NPS management actions and policies for the area. Indirect, direct, and cumulative impacts of construction of the proposed action would be moderate to minor with the appropriate implementation of the mitigation measures.

# **1 Purpose and Need**

## **Introduction**

The National Park Service (NPS) proposes construction of multi-unit dwellings to be made available to employees working in Grand Canyon National Park (GRCA). The employee housing would consist of the construction of two two-story apartment buildings consisting of a total of 16 apartments. The proposed activities would occur within the vicinity of Grand Canyon Village, Grand Canyon National Park, Coconino County, Arizona (see Appendix A) and would implement a portion of the *1995 General Management Plan* (GMP) for GRCA. Work would begin in 2003 for the new housing facilities.

## **Purpose and Need**

The proposed activity is part of a comprehensive effort under the 1995 GMP to accommodate needed housing while minimizing resource impacts and conflicts. The proposed housing is needed because existing facilities cannot adequately accommodate current needs for employees. Although visitation numbers have fluctuated, NPS estimated that visitation would increase along the South Rim by 25 percent from 1997 to 2025 (G. Wright, GRCA, pers. comm. 2001). The 1995 *Final General Management Plan and Environmental Impact Statement, Grand Canyon National Park* (GMP EIS) contains the pertinent statements related to proposed changes in the housing areas at Grand Canyon Village. The number of proposed housing units to be built is included as part of the GMP figure. The proposed housing development is well away from the canyon rim (approximately 0.5 mile), in an area that will not be seen by visitors.

The proposed action (construction of employee housing) is intended to implement the above provisions of the GMP. None of the needs identified in the GMP have changed significantly.

## **Management and Planning History**

GRCA is currently operating under the direction of the 1995 GMP. This plan provides guidance for resource management, visitor use, and general development for a period of 10 to 15 years. Decisions made for Grand Canyon Village at the South Rim in the GMP include providing up to 500 housing units would be provided within the disturbed areas to replace some 115 substandard housing units, to reduce overcrowding, and to meet additional NPS and concessioner housing needs.

Comments from general public scoping included concern of degradation of rim views depending on the proximity of housing to the South Rim of the canyon, need for additional housing for park employees, and monies going for this construction project rather than for public transportation. Support was expressed for construction of additional employee housing. Public scoping comments have been considered in this EA/AEF.

This EA/AEF incorporates by reference and tiers to the GMP EIS. Please also refer to “Purpose and Need” above for additional information concerning management and planning history.

## Issues and Impact Topics

National Park Service specialists, with input from federal, state, and local agencies identified issues and concerns (i.e. impact topics) affecting this project. An “issue” is an effect on a physical, biological, social, or economic resource. The predicted effects of an activity create the issue. Issues may come from the public, from within an agency or department, or from another agency (Freeman and Jenson 1998). After public scoping, issues and concerns were distilled into distinct impact topics to facilitate the analysis of environmental consequences, which allows for a standardized comparison between Alternatives based on the most relevant information. Once issues are identified, they are used to help formulate the alternatives and mitigation measures. Impact topics are then selected for detailed analysis based on substantive issues, environmental statutes, regulations and executive orders, and revised *NPS Management Policies* (2001). A summary of the impact topics and rationale for selection/dismissal are given below.

### Impact Topics Analyzed in this Document

#### VEGETATION

Proposed construction would involve the disturbance of vegetation communities. Existing trees would be removed and construction would result in ground disturbance. Therefore, this topic will be analyzed in this document.

#### EXOTIC VEGETATION AND NOXIOUS WEEDS

Proposed ground disturbance could create conditions favorable to exotic vegetation and noxious weeds. In addition, construction equipment could spread existing populations of exotic vegetation and noxious weeds. Therefore, this topic will be analyzed in this document.

#### WILDLIFE

#### MEXICAN SPOTTED OWL, CALIFORNIA CONDOR, NORTHERN GOSHAWK AND AMERICAN PEREGRINE FALCON

The U.S. Fish and Wildlife Service (USFWS) has listed the Mexican spotted owl (*Strix occidentalis lucida*) as threatened, and the California condor (*Gymnops californianus*) as endangered. The Arizona population of the California condor is also noted as an experimental/nonessential population, and is considered threatened in GRCA. The Northern goshawk (*Accipiter gentilis*) and American peregrine falcon (*Falco peregrinus anatum*) are both considered as Species of Concern by USFWS. Proposed activities have the potential to impact these listed and sensitive species. Therefore, impacts to the Mexican spotted owl, California condor, Northern goshawk, and peregrine falcon will be analyzed in this document.

Please see Appendix B for the list of threatened, endangered, and species of concern that may occur in the project area. No other threatened or endangered species are impacted by the proposed action. (Refer to next section, Impact Topics Dismissed from this Document.)

#### CULTURAL RESOURCES

A prehistoric property is located adjacent to the employee housing site. This property is considered eligible for the National Register of Historic Places (NRHP) and may be impacted by the construction of the housing facilities. Because a Cultural Landscape Inventory of the new employee housing area has not been completed, it is difficult to determine cultural landscape impacts to this area. No sites of special ethnographic significance to tribes are known to exist within the boundaries of proposed development. Therefore, cultural resources will be analyzed in this document.



## **SOILS**

The site is on the Coconino Plateau, which is capped by the Kaibab Formation and consists of sandstones, redbeds, chert, dolomite, and some limestone (NRCS 2001). Soils tend to be shallow, poorly developed, and stable (GMP 1995). Soils derived from the Kaibab Formation are generally characterized by high infiltration capacity, low moisture-holding capacity, and low soil fertility (Roundy 1996). Importation of soil for fill would not be needed or would be negligible for the construction of new employee housing. There is very little existing ground disturbance at the employee housing site. The construction of the housing units and parking lot would require grading of the site. For these reasons, the proposed action may have an effect on soils. Therefore, impacts on soils will be evaluated for the new employee housing site in this document.

## **Impact Topics Dismissed from this Document**

### **AIR QUALITY**

Project construction could potentially result in an increase in fugitive dust from soil exposure and disturbance. However, this effect would occur only during the construction period and would be localized and negligible. Water or water-based dust control agents would be applied during construction, as necessary, to minimize dust. Project activities would increase vehicle emissions from construction equipment. However, emissions would be localized and would have an immeasurable effect on regional and local pollutant levels. Any increase in dust from the increased presence of employees in the area would be considered negligible. Therefore, this topic will not be further analyzed in this document.

### **ENVIRONMENTAL JUSTICE**

Executive Order 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects on minority and low-income populations. None of the proposed alternatives would have a disproportionately high and adverse effect on any minority or low-income population or community. The proposed action would not have health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency's Draft Environmental Justice Guidance (July 1960). Therefore, this topic will not be further analyzed in this document.

### **GEOLOGY AND TOPOGRAPHY**

Alteration of geologic processes and features are not proposed in any of the alternatives. No major earthmoving or blasting activities are proposed that would impact the geologic processes or features or cause substantial alteration of the topography. Therefore, this topic will not be further analyzed in this document.

### **PARK OPERATIONS**

Operations would not be affected by the proposed construction of the new employee housing facility. Therefore, this topic will not be further analyzed in this document.

### **PRIME AND UNIQUE AGRICULTURAL LAND**

The soils and topography within GRCA are not conducive to agriculture. The soils in the vicinity of Grand Canyon Village tend to be shallow and poorly developed. No prime farmland or unique agricultural lands exist within GRCA, and therefore, this topic will not be further analyzed in this document.

### **SOCIOECONOMIC ENVIRONMENT**

The socioeconomic environment consists of local and regional businesses and residents, the local and regional economy, and park concessions. The local economy and most businesses in the surrounding communities are based on professional services, construction, tourist sales and services, and educational research. The regional economy is strongly influenced by tourist activity. The GMP EIS discussed the socioeconomic environment and impacts extensively. The proposed alternative would not change local or regional land use. GRCA businesses would not suffer any appreciable adverse short- or long-term economic impacts from construction of new employee housing because traffic flow into and out of Grand Canyon Village would not be affected. The short-

and long-term socioeconomic impacts of the employee housing would be consistent with the impacts described in the GMP EIS. Therefore, this topic will not be further analyzed in this document.

## **NOISE**

Noise impacts from this project would last only for the duration of the construction. After construction is completed, any negligibly heightened noise levels would return to existing condition. Construction would occur during daylight hours when roads and the associated traffic already impact the two sites. Any additional construction-related traffic would only be temporary and would negligibly affect the areas in the short term. No blasting would be needed to construct the facility. The construction of the new housing facility would have no appreciable effects on the existing noise conditions; therefore, this topic will not be analyzed further in this document.

## **THREATENED, ENDANGERED, AND SPECIES OF CONCERN – PLANTS**

The USFWS has determined that eight federally listed proposed, threatened, or endangered plant species may occur or have habitat in the Grand Canyon area. (Refer to Appendix B.) In addition to the federally listed species, the NPS must consider state listed special status species. A qualified biologist reviewed the project area and determined that habitat for the federal and state listed plant species does not exist at the employee housing site. This determination is based on site-specific knowledge of the Grand Canyon Village near the South Rim area, reconnaissance of the area, knowledge of the species and habitats in question, and professional judgment. None of the listed plant species are known to occur in the area. Sentry milk-vetch (*Astragalus cremnophylax* var. *cremnophylax*) is an endangered plant found at Maricopa Point and the rim areas. Suitable habitat does not occur at the new employee housing site. Therefore, this topic will not be further analyzed in this document.

## **THREATENED, ENDANGERED, AND SPECIES OF CONCERN – WILDLIFE**

In addition to the Mexican spotted owl and California condor, USFWS has listed eight other species as proposed, threatened, or endangered wildlife species that may occur or have habitat in the Grand Canyon area. (Refer to Appendix B.) A qualified biologist has determined that habitat for the additional federal and state-listed species (not including the Mexican spotted owl, peregrine falcon, and Northern goshawk) does not exist at the new employee housing site. This determination is based on site-specific knowledge of Grand Canyon Village near the South Rim area, reconnaissance of the area, knowledge of the species and habitats in question, and professional judgment. None of these additional species is known to occur in the Grand Canyon Village near the South Rim area. Therefore, species other than the Mexican spotted owl, California condor, peregrine falcon, and Northern goshawk would not be affected by the proposed action and will not be further analyzed in this document.

## **WILDLIFE – GENERAL**

Many resident and migratory species of wildlife inhabit GRCA, including 90 species of mammals, 290 species of birds, 60 species of reptiles and amphibians, and 25 species of fish (1995 GMP EIS). Common mammals include mule deer, elk, coyote, gray fox, black-tailed jackrabbit, striped skunk, golden-mantled ground squirrel, and several other rodent and bat species. Steller's and pinyon jay, western bluebird, red-tailed hawk, common raven, several wren and sparrow species, and northern flicker are common resident bird species.

The new employee housing site is in a developed area that supports residential populations and vehicular traffic. Wildlife in the project area would be exposed to similar levels of disturbance and human activity and would be negligibly affected by the construction of the new facility. Therefore this topic will not be further analyzed in this document.

## **FLOODPLAIN MANAGEMENT**

Executive Order 11988 requires federal agencies to examine potential risks and impacts of placing facilities within floodplains. The employee housing site is not located in or adjacent to a designated 100-year floodplain. Therefore, this topic will not be further analyzed in this document.

## **WATER RESOURCES**

Despite the increase of impermeable surfaces created by the proposed construction of the new employee housing, most surface water would continue to be lost through evapotranspiration or incorporated into the ground water system. Surface runoff usually occurs only following severe storm events. Stormwater pollution prevention is normally a concern during new construction and following the completion of construction until the site returns to a stabilized condition. All National Pollutant Discharge Elimination System (NPDES) requirements would be met. Implementation of erosion control measures during construction would result in a negligible impact on water quality at the new employee housing site. The present water storage capacity is sufficient to meet the present and foreseeable water needs of Grand Canyon Village for both potable and fire suppression water needs. The proposed development would therefore not likely affect water quantity. There are no defined drainages within the employee housing site. Therefore, this topic will not be further analyzed in this document.

## **WETLANDS**

Executive Order 11990 requires federal agencies to avoid impacts on wetlands where possible. No jurisdictional wetlands exist at or near the new employee housing site. There are no natural wetlands on the South Rim. Erosion during construction would be minimized by the implementation of best management practice. Therefore, wetlands will not be further analyzed in this document.

## **VISITOR EXPERIENCE**

The employee housing construction would not be visible from the Grand Canyon Village area or other visitor areas along the South Rim. Visitor activities would not be affected by the proposed construction-related activities. Because the site is located away from visitor areas and the South Rim of the canyon, visitor experience related to views of the canyon would not be affected. Therefore, this topic will not be further analyzed in this document.

## **VISUAL RESOURCES**

Visual impacts from the construction of the employee housing would be negligible because the site is not visible from visitor-use areas and it is adjacent to an existing housing development. Therefore, this topic will not be further analyzed in this document.

## 2 Alternatives

This section describes two alternatives for this project. A summary table comparing the environmental consequences of each alternative is presented at the end of the alternatives section.

### Items Applicable to All Action Alternatives

The descriptions of alternatives are based on best information available at the time of this writing. If changes during design were not consistent with the intent and effects of the selected alternative, then additional compliance would be needed. All action alternatives would meet the following criteria:

- meet as closely as possible the objectives and decisions made in the GMP;
- utilize existing roads and disturbed areas wherever possible; and
- minimize adverse impacts to archeological and historic sites.

### Alternatives Description

The no action and action alternatives are described below. Table 2.1 and 2.2 provide a comparison of the alternatives.

#### ALTERNATIVE A – NO ACTION

No new employee housing facilities would be constructed. Alternative A does not satisfy GRCA's need for new or replacement housing for the South Rim Village area.

#### ALTERNATIVE B – PREFERRED

The proposed employee housing facility would be constructed on a project site located on the east side of Mohave Street, just south of Albright Avenue and would consist of two 9,576-square foot two-story housing buildings, 32 paved parking spaces, and associated utility and infrastructure connections. Construction of the housing units would result in ground disturbance to approximately 1.16 acres. The housing units would be built in conformance with the Architectural Barriers Act of 1968 (P.L.90-480), the Rehabilitation Act of 1973 (P.L.93-112), and the 1984 Uniform Federal Accessibility Standards (UFAS), 49 CFR 31528. Much of the necessary existing underground utility infrastructure is in place. Connection of new structures to these existing utilities would be required and any undersized or substandard utilities would be replaced. Any necessary utilities not already in place would be provided. The 2 8-plexes would be constructed to ensure that the buildings are in character with other housing in this area of the South Rim Village and with the general character of buildings within GRCA.

### Comparison of Alternatives

The following section summarizes the alternatives by proposed activities and impacts. Table 2.1 summarizes the proposed activities, which are described in detail under each alternative. Table 2.2 summarizes the impacts of the alternatives by impact topics described in detail in Chapter 4 Environmental Consequences.

**Table 2.1 Comparison of Proposed Activities**

Proposed Activity	Alternative A	Alternative B
Construction of new housing	None	16 units, consisting of two - 9,576-sq. ft buildings.
New parking spaces provided for housing	None	32 parking spaces

**Table 2.2 Summary Comparison of Impacts**

Impact Topic	Alternative A	Alternative B
Vegetation	No direct or indirect impacts would be expected. Cumulative impacts would be minor, long-term adverse impacts because the impacts would primarily occur in areas where the biotic communities are already degraded.	A total of approximately 1.16 acres of habitat would be disturbed for the construction of the new employee housing facility. Removal of existing trees and other vegetation would be required. Where possible, existing vegetation would be removed by trained experts and replanted to revegetate areas disturbed by this action alternative. Overall direct, indirect, and cumulative impacts to biotic communities would be considered negligible to minor due to the relative small loss of habitat and the common occurrence of the ponderosa pine and pinyon-juniper habitats.
Exotic Vegetation and Noxious Weeds	No risk to the spread of exotic vegetation and noxious weeds. Cumulative impacts would be minor adverse long-term impacts because project-specific mitigation measures would be implemented.	Mitigation measures associated with the project should be sufficient to ensure exotic vegetation does not become a concern at the employee housing site or at Grand Canyon Village. Augmented exotic vegetation control measures would provide an improvement to existing controls. For these reasons, direct, indirect and cumulative impacts under the preferred alternative would be negligible in intensity, long-term adverse impacts.
Mexican Spotted Owl	The no action alternative would have no direct or indirect impacts on the Mexican spotted owl. Cumulative impacts would have no affect on the Mexican spotted owl or its habitat because mitigation measures to avoid disturbance from construction activities would be taken.	Direct, indirect, and cumulative impacts of the construction of the new employee housing facilities would be considered a may affect, not likely to affect the Mexican spotted owl or its habitat.
California Condor	The no action alternative would have no direct or indirect impacts on the California condor. Cumulative impacts may affect but is not likely to adversely affect the California condor because roosting, perching, and foraging habitat is close to Grand Canyon Village.	The preferred alternative would result in modification of suitable perching, roosting, and foraging habitat and could result in "take" of individual condors due to excessive noise or harassment by visitors or construction workers. However, condors are a wide-ranging species, and the amount of foraging and perching/roosting habitat that would be adversely modified is insignificant when compared to habitat currently available for condors throughout their Arizona range. Furthermore, "take" due to negative human-condor interactions is unlikely to occur due to mitigation measures that would be employed to prevent such interactions. Therefore, the proposed project may affect the California condor, but is not likely to adversely affect the California condor or its habitat.
Northern Goshawk	The no action alternative would have no direct or indirect impacts on the Northern goshawk. Cumulative impacts may impact individual Northern goshawks, but is not likely to result in a trend toward federal listing as a threatened or endangered species or loss of viability.	The project would result in modification to suitable Northern goshawk habitat, and could potentially disrupt the activities of Northern goshawks in the area due to construction noise disturbance. Therefore, the project may impact individual Northern goshawks, but is not likely to result in a trend toward federal listing as a threatened or endangered species or a loss of species viability.

**Table 2.2 Summary Comparison of Impacts - continued**

Impact Topic	Alternative A	Alternative B
Peregrine Falcon	The no action alternative would have no direct or indirect impacts on the peregrine falcon. Foreseeable future developments would be primarily confined to existing developed areas and thus would have a negligible long-term cumulative impact on falcon habitat.	The project would result in modification to suitable peregrine falcon foraging, perching, and roosting habitat, and could potentially disrupt the activities of peregrine falcons known to nest in the area due to excessive noise disturbance. Therefore, the project may impact individual peregrine falcons, but is not likely to result in a trend toward federal listing as a threatened or endangered species or a loss of species viability.
Soils	Implementing the no action alternative would have no impacts on soils. Cumulative impacts could consist of minor in intensity, long-term adverse impacts on soil resources due to soil displacement and compaction in some areas to accommodate new buildings and related improvements.	Implementing the preferred alternative would have adverse long-term impacts, minor in intensity, on soils due to soil displacement and compaction. Cumulative impacts could consist of long-term adverse impacts, minor in intensity, on soils due to site grading and earthmoving in some areas to accommodate new buildings and related improvements.
Cultural Resources	No direct or indirect effects on cultural resources are anticipated as a consequence of the continuation of current NPS management actions and policies for the area. Increasing visitor use and other foreseeable development at Grand Canyon Village, however, pose a long-term moderate adverse impacts that archeological, historical, or ethnographic resources and landscapes may be disturbed or diminished. Steps would be taken to preclude or minimize loss or disturbance of cultural resources as part of any other foreseeable future development so that any long-term cumulative impacts would be minor.	There are expected to be direct and indirect effects on cultural resources as a consequence of the continuation of current NPS management actions and policies for the area. Increasing visitor use and other foreseeable development at Grand Canyon Village, however, pose a long-term moderate adverse impact that archeological, historical, or ethnographic resources and landscapes may be disturbed. Steps would be taken to preclude or minimize loss or disturbance of cultural resources as part of any other foreseeable future development so that any adverse long-term cumulative impacts would be minor.

## Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which is guided by the Council on Environmental Quality (CEQ). CEQ provides direction that “[t]he environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA’s Section 101:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. assure for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
4. preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice;
5. achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life’s amenities; and
6. enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.”

NPS policy requires identification of an environmentally preferred alternative. Alternative B is the environmentally preferred alternative for the following reasons:

- Alternative B would minimize the need for employees to commute to the area, which would minimize the use of vehicles and the production of carbon dioxide and other undesirable byproducts of vehicle use.
- Alternative B would provide for a better human environment by providing adequate facilities for living and working.

Alternative B, the preferred alternative, meets the project objectives of providing new housing according to the GMP. Alternative A, the no action alternative, would not meet the project objectives.

## **Mitigation Measures Applicable to Preferred Alternative**

Mitigation measures have been designed to minimize, reduce, or eliminate impacts of the proposed actions. The following mitigation measures would apply to the preferred alternative.

## **CONTRACTOR ORIENTATION**

Contractors working in GRCA are given orientation concerning proper conduct of operations. This orientation is provided in both written form and orally (at a pre-construction meeting). This policy would apply to both construction projects. Orientation topics for the employee housing work would include:

- Wildlife should not be approached or fed.
- Cultural resource material should not be collected.
- Collecting of any GRCA resources, including plants and animals, is prohibited.
- Contractor must have a safety policy in place and follow it.
- Other environmental concerns and requirements discussed elsewhere in this EA/AEF would be addressed.

## **AIR QUALITY**

To minimize impacts to local air quality, water would be applied as a dust-control agent as necessary during construction. Unnecessary engine idling would not be permitted; idling would be allowed only to the amount needed to ensure proper equipment operation.

If asphalt is used for the parking areas at the proposed 8-plex site, an emulsion-based asphalt is preferred to a solvent-based (“cutback”) asphalt. If it is necessary to use cutback asphalt, slower-curing asphalts would reduce pollutant concentrations. The pollutants of concern are volatile organic compounds (VOCs), which play a major role in ozone formation. If an asphalt batch plant is used, it should be propane fired, (batch plants can also be fired by diesel/fuel oil or tires).

## **NOISE**

Construction activities will raise noise levels in the vicinity above the ambient conditions. Noise sources include vehicles and power tools. To minimize noise impacts during construction, noise production would not occur during the overflight curfew hours from 6:00 p.m. to 8:00 a.m. between May 1 to September 30, and from 5:00 p.m. to 9:00 a.m. between October 1 to April 30.

## **WATER QUALITY**

To minimize potential impacts to water quality, the following mitigation measures would be incorporated into the action alternative:

- All NPDES requirements would be met.
- Standard erosion control measures such as silt fences, sand bags, or equivalent control methods would be used to minimize any potential sediment delivery to streams.

## **EXOTIC ANIMALS**

To prevent the importation of exotic animals such as rats and mice, all construction materials would be inspected. Such inspections should be conducted through consultation with the GRCA's Integrated Pest Manager.

## **EXOTIC VEGETATION AND NOXIOUS WEEDS**

To prevent the introduction and minimize the spread of exotic vegetation and noxious weeds, the following mitigation measures would be incorporated into the action alternative.

- Existing populations of exotic vegetation at the construction site would be treated prior to construction activities.
- All heavy construction equipment that would leave the road (e.g., bulldozers and backhoes) would be pressure washed prior to entering GRCA.
- The location of the staging area for construction equipment would be park-approved and treated for exotic vegetation.
- Parking of vehicles would be limited to existing roads or the staging area.
- Any fill, rock, or additional topsoil needed would be obtained from a park approved source.
- All areas disturbed by construction would be revegetated using site-adapted native seed and/or plants.
- Monitoring and follow-up treatment of exotic vegetation would occur for 2 to 3 years after construction is completed.

## **CALIFORNIA CONDOR**

To protect the California condor, the following mitigation measures would be incorporated into the action alternative.

- Prior to the start of a construction project, the GRCA would contact personnel monitoring California condor locations and movement within the GRCA to determine the locations and status of condors in or near the project area.
- If non-nesting condors occur within one mile of the project area, blasting if required, would be postponed until the condors leave or are hazed by permitted personnel.
- If condor nesting activity is known within one mile of the project area, then blasting activity if required, would be restricted during the active nesting season. The active nesting season is February 1 – September 30. These dates may be modified based on the most current information, in consultation with the GRCA biologist and the USFWS.
- If condor nesting activity is known within 0.5 mile of the project area, then light and heavy construction (see Appendix D for definitions of light and heavy construction activity) in the project area would be restricted during the active nesting season. The active nesting season is February 1 – September 30. These dates may be modified based on the most current information, in consultation with the GRCA biologist and the USFWS.
- If a condor occurs at the construction site, construction would cease until it leaves on its own or until techniques are employed by permitted personnel which results in the individual condor leaving the area.
- Construction workers and supervisors would be instructed to avoid interaction with condors and to immediately contact the appropriate GRCA or Peregrine fund personnel if and when condor(s) occur at a construction site.
- The construction site would be cleaned up at the end of each day the work is being conducted (i.e. trash disposed of, scrap materials picked up) to minimize the likelihood of condors visiting the site. GRCA Condor staff will complete a site visit to the area to ensure adequate clean-up measures are taken.
- To prevent water contamination and potential poisoning of condors, a vehicle fluid- leakage and spill plan would be developed and implemented for each construction project. The GRCA would use the first plan that is developed for a specific project as a template for a parkwide fluid-leakage and spill plan that would



apply to each construction project. This plan would be reviewed by the park biologist for adequacy in addressing condors.

- If a new structure occurs on the rim or above tree line in other areas, there may be a need to install condor deterrent devices on the structure. This would be evaluated on a case-by-case basis by the park wildlife biologist.

## **MEXICAN SPOTTED OWL**

To protect the Mexican Spotted Owl (MSO), the following mitigation measures would be incorporated into the action alternative.

- If a construction project occurs within a Protected Activity Center (PAC) with no known nest site, then all construction activity would be restricted to the non-breeding season (September 1 – February 28). However, if the project in a PAC is at least 0.5 mile from known nest sites and the project does not include blasting, then the project can be implemented during the breeding season. The breeding season is March 1 – August 31.
- If a construction project outside of PACs occurs within one mile of a known PAC nest or roost site, or the boundary of a PAC where the nest or roost site is not known, or unsurveyed restricted, protected, or predicted MSO habitat, then all blasting, if required in that project area, would be restricted to the non-breeding season (September 1 – February 28).
- If a construction project outside of PACs occurs within 0.5 mile of a known PAC nest or roost site, or the boundary of a PAC where the nest or roost site is not known, or unsurveyed restricted, protected, or predicted MSO habitat, then light and heavy construction activity (see Appendix D for definition of light and heavy construction activity) in that project area would be restricted to the non-breeding season (September 1 – February 28).
- Exceptions to the above measure are those situations where a project is within the developed urban zone (urbanized portion of Grand Canyon Village). If such projects are more than 0.25 mile from the MSO situations outlined above, then light construction activity (as defined in this document) can occur at any time for those projects.
- Surveys of MSO habitat would follow all aspects of standard protocol.

## **NORTHERN GOSHAWK AND PEREGRINE FALCON**

Blasting, if required, would be limited to the non-breeding season for Northern goshawk and peregrine falcon (September 1 through January 31).

## **BLASTING**

Blasting is not anticipated for this project. The contractor would investigate all reasonable and prudent alternatives to the use of explosives for blasting, and shall not use explosives unless deemed necessary. If blasting is necessary, the following mitigation measures will apply (in addition to those measures discussed above for California condor, Mexican spotted owl, Northern goshawk, and peregrine falcon regarding blasting).

- Blasting mats would be used to minimize air blast and fly rock.
- Controlled/sequential blasting techniques would be employed to minimize blast noise.
- Only the minimum amount of charge necessary to meet the objectives would be used.
- The blasting safety plan and shot design would be reviewed by NPS.

## **ARCHITECTURAL GUIDELINES**

Architectural styles and finishes of the employee 8-plexes would be differentiated yet compatible with other buildings in the Grand Canyon Village residential housing area.

## CULTURAL RESOURCES

To minimize the impacts of construction activities on cultural resources, the following mitigation measures would be incorporated into the action alternative.

- If previously unknown archeological resources are discovered during construction, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented.
- An appropriate mitigation strategy would be developed, if necessary, in accordance with the stipulations of the 1995 *Programmatic Agreement Among the National Park Service; the Arizona State Historic Preservation Officer; and the Advisory Council on Historic Preservation Regarding the Draft General Management Plan/Environmental Impact Statement, GRCA, Arizona*.
- All workers would be informed of the penalties for illegally collecting artifacts or intentionally damaging any archeological or historic property.
- Workers would be informed of the correct procedures if previously unknown resources are uncovered during construction activities.
- Data recovery excavations would be carried out to mitigate adverse affects as outlined in the section on environmental consequences.
- Any equipment yards or other construction-related activities would occur within the designated limits of disturbance.
- No construction vehicle movement would occur outside the construction access limits.
- Vegetation would be preserved and protected outside of the specified clearing limits.
- The contractor would remove only trees when specifically authorized to do so by NPS and would avoid damaging vegetation that is to remain in place.
- Archeological surveys have been conducted to identify resources in the area of potential effect. Should unknown buried deposits be located, data recovery excavations would be undertaken. These subsurface investigation and data recovery efforts would be guided by a project-specific research design. Additionally, NPS would begin consultations under the Native American Graves Protection and Repatriation Act in the event that buried human remains are discovered during archeological excavations or project development.

## LIGHTING

To minimize light pollution, the maximum level of outdoor lighting would comply with the requirements of Astronomical Zone 1 (most stringent) of the Coconino County Lighting Ordinance (Section 17).

# 3 Affected Environment

This chapter describes the existing environment of the resources that may be affected (impact topics) and provides the baseline for comparison of the alternatives. GRCA encompasses 1.2 million acres in northern Arizona. The proposed project is located at Grand Canyon Village, which is along the South Rim of the Grand Canyon. Grand Canyon Village is located approximately 6 miles north of Tusayan, Arizona. It serves as the south entrance to GRCA and provides many services such as lodging, restaurants, entertainment, and orientation.

## Natural Resources

## SOILS

The South Rim of the Grand Canyon is located on the Coconino Plateau and consists of sandstones, redbeds, chert, dolomite, and some limestone (NRCS 2000). The Coconino Plateau is capped by the Kaibab Formation. Soils derived from the Kaibab Formation are generally characterized by high infiltration capacity, low moisture-holding capacity, and low soil fertility (Roundy 1996). Soils tend to be shallow, poorly developed, and stable (GMP 1995). There is no detailed soil mapping for the employee housing site.

## **VEGETATION**

The employee housing site area is primarily pinyon-juniper habitat. Dominant vegetation on the employee housing site is primarily pinyon pine (*Pinus edulis*) and juniper (*Juniperus spp.*) with a few mature ponderosa pine (*Pinus ponderosa*) and a ground layer of grasses such as muttongrass (*Poa fendleriana*), western wheatgrass (*Pascopyrum smithii*), and squirreltail (*Elymus elymoides*).

## **EXOTIC VEGETATION AND NOXIOUS WEEDS**

Almost 150 exotic plant species are known to exist in GRCA. Exotic vegetation and noxious weeds for the South Rim of the Grand Canyon are listed in Appendix C. The majority of the exotic plant species that exist on the South Rim of the Grand Canyon have not been found on the employee housing site. The employee housing site does have cheatgrass (*Bromus tectorum*).

## **WILDLIFE**

The project site is considered to be ecotonal between the Petran Montane Conifer Forest and the Great Basin Conifer Woodland Biotic Communities (Brown 1994). A wide variety of wildlife species use the community types near the employee housing site. Common birds include Steller's jay, pinyon jay, raven, violet-green swallow, white-throated swift, hairy and Lewis's woodpecker, rock wren, plain titmouse, several nut hatch species, mountain and western bluebird, mountain chickadee, common bushtit, long-eared owls, turkey vultures, condors, and black-chinned and broad-tailed hummingbirds. Raptors include red-tailed hawks, peregrine falcons, sharp-shinned hawks, and great horned owls. Small mammals include the Albert squirrel, rock squirrel, golden-mantled ground squirrel, pocket gopher, striped skunk, forest and cliff dwelling bat species, deer mouse, pinyon mouse, and voles. Large mammals frequently observed are mule deer, elk, mountain lion, bobcat, badger, and coyote.

## **MEXICAN SPOTTED OWL**

The Mexican spotted owl (*Strix occidentalis lucida*) was listed as a threatened species in March 1993. On February 1, 2001, the USFWS finalized the designation of 4.5 million acres of critical habitat for the owl. Critical habitat has been designated in the Grand Canyon, and includes most of GRCA except the South Rim. The project is located approximately 0.5 miles south of the designated critical habitat boundary (USFWS 2001a). Mexican spotted owls are generally found in habitat that include mixed conifer and pine-oak forests, riparian madrean woodland, and sandstone canyonlands at elevations ranging from 4,500 to 10,000 feet above mean sea level (msl) (USFWS 1995). However, Mexican spotted owls have been found in relatively open shrub and woodland vegetation communities in arid canyonland habitat (Willey 1995), contrary to the typical mature forest habitat believed to be the classical norm.

Nesting habitat is typically in areas with complex forest structure or rocky canyons, and contains mature or old growth stand, which are uneven aged, multi-storied, and have high canopy closure. The majority of nests appear to be in Douglas fir trees. A wider variety of tree species is used for roosting; however, Douglas fir is the most commonly used species. Foraging owls use a wider variety of forest conditions than they use for nesting or roosting (USFWS 2000). Mexican spotted owls consume a variety of prey but commonly eat small and medium-

sized rodents such as woodrats, mice, and voles. They may also consume bats, birds, reptiles, and anthropods. A diverse prey base is dependant on the availability and quality of diverse habitats (USFWS 2000).

The presence of Mexican spotted owls within GRCA was confirmed in 1992 through field surveys. Additional Mexican spotted owl surveys occurred in 1994 and 1995 along the South Rim. These surveys resulted in negative results. In 1999, six surveys were conducted in side canyon habitat along the Colorado River corridor, and responses were received at six locations. In addition, owls were located during surveys along the river corridor in 2000 and 2001 (E. Leslie, GRCA, pers. comm. 2001).

The size and extent of the Mexican spotted owl population at the Grand Canyon are currently uncertain. However, surveys and location of discoveries suggest that Mexican spotted owls occupy the rugged canyonland terrain within the Grand Canyon. An extensive Mexican spotted owl survey is currently ongoing in GRCA, with crews surveying owl habitat along the inner canyon and river corridor, below the south and north rims, and portions of the north rim plateau. Surveys in the project vicinity were conducted in 2001, and Mexican spotted owls were observed in the Pipe Spring area. The Pipe Spring owls are the nearest known occurrence of Mexican spotted owls (E. Leslie, GRCA, pers. comm. 2001).

The Mexican Spotted Owl Recovery Plan (USFWS 1995) provides for three levels of habitat management: protected areas, restricted areas, and other forest and woodland types. Protected Activity Centers (PACs) are currently being established in GRCA based on recent information. Primary constituent elements of restricted habitat include such things as high density of live trees, uneven ages of trees, and high density of snags. Primary constituent elements within the canyon include cooler and more humid conditions than the surrounding area, clumps or stringers of trees, canyon walls with crevices, ledges or caves, a high percentage of ground litter or woody debris, and riparian or woody vegetation.

The employee housing site contains predominately pinyon pines and junipers on relatively level ground without suitable Mexican spotted owl habitat characteristics. In addition, the site's habitat would be classified as the "other forest and woodland" type under the Recovery Plan, for which no management recommendations are made (USFWS 1995). The employee housing site is not located within the boundary of designated critical habitat. The nearest suitable habitat is located within 0.5 mile of the new employee housing site; however, this habitat has been surveyed to protocol and is currently unoccupied (R. Ward, GRCA, pers. comm. 2002). The nearest occupied Mexican spotted owl habitat is at the Pipe Spring area, located below the rim approximately 2.5 miles northeast of the new employee housing site (E. Leslie, GRCA, pers. comm. 2001).

## **CALIFORNIA CONDOR**

The USFWS federally listed the California condor (*Gymnops californianus*) as endangered in March 1967. In 1996, the USFWS established a nonessential/experimental population of California condors in Northern Arizona with subsequent releases in 1997, 1998, 1999, 2000, and 2002. The reintroduced condors are an "experimental/nonessential population" as characterized under Section 10(j) of the Endangered Species Act. By declaring the population "nonessential/experimental," the USFWS can treat this population as "threatened" and develop regulations for management of the population that are less restrictive than mandatory prohibitions covering endangered species. This facilitates efforts to return the condor to the wild by providing increased opportunities to minimize conflict between the management of the condors with other activities. Within GRCA, the condor has the full protection of a threatened species. The South Rim of the Grand Canyon is located within the experimental population area designated for the condor and contains suitable habitat for perching, roosting, and foraging. Nesting habitat for California condor includes various types of rock formations such as crevices, overhung ledges, and potholes. Condors will forage wherever there is a carcass. Roost sites include cliffs and tall trees, including dead trees (snags) (USFWS 1996).

As of this year, the population of free-flying condors in Arizona totaled 36. Monitoring data indicate condors are using habitat throughout GRCA. During the late fall and winter months they can be found along the river corridor

and upper reaches of the Marble Canyon area. During spring and summer months, they routinely utilize habitat between Desert View and Hermits Rest on the South Rim to Bright Angel Point and Cape Royal on the North Rim (E. Leslie, GRCA, pers. comm. 2001).

The employee housing site contains suitable California condor roosting and foraging habitat, but no nest sites are known to occur in the vicinity. Potentially suitable nesting habitat in the form of cliffs is approximately 0.5 mile from the employee housing site.

### **NORTHERN GOSHAWK**

The Northern goshawk (*Accipiter gentiles*) does not receive protection under the Endangered Species Act, but is considered a Species of Concern by the USFWS. Concerns for this species arise from documented declines, probably due to widespread cutting of old-growth forest. Goshawks in Arizona typically occupy the same habitat type regardless of season, which commonly includes pine forests along the Mogollon Rim, Kaibab Plateau, and the southeastern mountains above 6,000 feet above msl. However, a goshawk nest has been documented at lower elevations in oak forests at 4,900 feet above msl (Glinski 1998).

Northern goshawk surveys were conducted at GRCA in June and July of 2000 in ponderosa pine drainages on the South Rim, from the Desert View area west to the Hermits Rest area. Two nests were found during these surveys and two additional nests were found incidentally in late June. Each of the four nests had two young, and three of the four nests still had young in the nest or nest tree that was defended by one adult. At the fourth nest, the young had fledged and both adults were observed in the area. In addition to nests, four single immature Northern goshawks and a possible adult goshawk were also observed on different days and in different locations (E. Leslie, GRCA, pers. comm. 2001).

Three of the nests were located between Horsethief Tank and State Route (SR) 64, west and south of Grand Canyon Village, and one nest was located south of Desert View. One of the four immature Northern goshawks was observed in July 2000 just outside the GRCA boundary at the edge of Long Jim Canyon, where the canyon meets the highway near the Tusayan Ranger Station.

The employee housing site contains suitable foraging and perching/roosting Northern goshawk habitat. The nearest known Northern goshawk territory is located 0.25 mile of the employee housing site (E. Leslie, GRCA, pers. comm. 2001).

### **PEREGRINE FALCON**

The peregrine falcon (*Falco peregrinus anatum*) was listed as endangered in 1970. In August 1999, the USFWS removed the American peregrine falcon from the federal list of endangered and threatened wildlife due to its recovery, but the agency still considers the falcon as a species of concern. The principal cause of the peregrine's decline was chlorinated pesticides, especially DDT and its metabolite DDE, which accumulated in peregrines as a result of feeding on contaminated prey. The pesticides interfere with calcium metabolism and resulted in reduced reproductive success due to thin eggshells.

The population of peregrine falcons in Arizona is steadily increasing. In 1991, the peregrine falcon population in the Rocky Mountain/Southwest region was 367 known pairs; in 1998, the number of pairs increased to 535. In Arizona, the known number of peregrine falcon pairs was 159 in 1999 (USFWS 1999). Peregrine falcons generally nest on cliffs, near water. However, river cutbanks, trees, and manmade structures have been used as nesting habitat (Glinski 1998). Peregrine falcons feed primarily on other birds, such as songbirds, shorebirds, and waterfowl. The usual method of obtaining prey is by attacking flying birds from above or chasing them from behind. A peregrine eyrie exists in the Grand Canyon Village vicinity. This eyrie is known to have been occupied since 1988 and the birds appear to be adapted to humans. The eyrie is in an area of steep rugged terrain, without trails, unlikely to be accessed by Grand Canyon visitors.

Suitable nesting habitat in the form of cliffs is located below the edge of the canyon rim, which is approximately 0.5 mile from the employee housing site. In addition, peregrines are occasionally observed foraging in forested areas of GRCA, which would include the employee housing site (E. Leslie, GRCA, pers. comm. 2001). The nearest known active peregrine falcon territory is located approximately 1.6 miles northwest of the employee housing site.

## **CULTURAL RESOURCES**

### **ETHNOGRAPHIC RESOURCES**

Ethnographic resources are defined by NPS as any “site, structure, object, landscape, or natural resource feature assigned traditional, legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it” (*Cultural Resource Management Guidelines* [DO-28:191]). The lands of GRCA are traditionally affiliated with nine Indian groups: Havasupai, Hopi Tribe, Hualapai Tribe, Kaibab Paiute tribe, Navajo Nation, Paiute Indian Tribe of Utah, White Mountain Apache tribe, San Juan Southern Paiute tribe, and Pueblo of Zuni. There are no known ethnographic resources in either the project area or its general vicinity. Copies of the environmental assessment will be forwarded to each affiliated tribe for review and comment. If the tribes subsequently identify the presence of ethnographic resources, appropriate mitigation measures would be undertaken in consultation with the tribes. The location of ethnographic sites would not be made public.

### **ARCHEOLOGICAL RESOURCES**

The earliest recorded prehistoric culture in the American Southwest is the Paleoindian (9500-7500 B.C.). Paleoindians maintained an extremely mobile hunting and gathering lifestyle that included hunting now extinct animals such as the mammoth. Paleoindian cultural remains are characterized by large, finely crafted projectile points. In addition to hunting, this group most likely relied on wild plants for food, fibers, and tools, although this aspect of their existence is not easily documented. Population during the Paleoindian period was small, and remains from Paleoindian occupation of the Grand Canyon area are scarce. Evidence from in the canyon itself consists mainly of a chert Folsom projectile point from the Little Colorado River Gorge (Ahlstrom et al. 1993).

During the subsequent Archaic period (7500-300 B.C.), population increased and subsistence patterns changed. Hunting and gathering still formed the basis of subsistence, but with the extinction of the mammoth and other similar animals, hunters focused on smaller game. The appearance of grinding implements provides evidence of the importance of wild plant gathering. Evidence of human activity in the Grand Canyon becomes more marked in the Late Archaic (after 2000 B.C.). The increased use may have resulted from favorable climate change (Ahlstrom et al. 1993). Evidence of human presence in the canyon includes the appearance of split-twist figurines in caves in the eastern Grand Canyon and pictographs at Shaman’s Gallery, an archaeological site in the western Grand Canyon. These cultural remains, although not found together, may be manifestations of ritual activity.

The Formative period in the Southwest is generally associated with the presence of agriculture. Ways of life continued to include hunting and gathering but with an increased reliance on domesticated food. Hunting involved the use of bow and arrow. Evidence for Basketmaker II Anasazi sites in the Grand Canyon is limited to roasting features that have been dated from 500 B.C. to A.D. 500. Formative period sites include permanent and semi-permanent habitations and limited activity areas such as check dams, field houses, and rock alignments associated with agricultural pursuits. Formative period groups that occupied the Grand Canyon area include the Cohonina and Puebloan cultures (Virgin Anasazi to the west and Kayenta Anasazi to the east). Cohonina sites have been identified in the Grand Canyon primarily by ceramic material. However, the nature and duration of Cohonina occupation is unclear (Ahlstrom et al. 1993). The majority of Formative sites in the Grand Canyon are ascribed to the Puebloan culture, based mainly on ceramics and, to some degree, architecture.

The introduction of ceramics denotes the start of the Basketmaker III period, traditionally placed at A.D. 500. Evidence for Basketmaker III existence in the Grand Canyon is sparse, possibly because such sites often lack distinguishing temporal diagnostics and are therefore difficult to identify (Fairley et al. 1994). The Pueblo I period (800-1000) marks the trend towards greater population aggregation, the creation of contiguous masonry structures, and a refinement of ceramic manufacture. Pueblo I sites have been located more often on the uplands around the Grand Canyon than in the canyon interior. The scarcity of sites from this time period in the canyon may result from problems with the identification of cultural affiliation and from the burial of cultural material by flood deposits.

Pueblo II period sites (1000-1150) are more numerous than sites from other time periods. These sites appear both within the Grand Canyon and in the uplands adjoining the canyon, and occupy every area with potentially arable land. Check dams, terraced gardens, and other agricultural features indicate an increasing reliance on cultigens for subsistence. Sites occurring outside the canyon are sometimes large, containing twelve or more rooms, while those within the canyon are smaller, usually not exceeding six contiguous rooms. Some seasonal movement between the areas may have taken place. The departure of Puebloan groups from the Grand Canyon area has been attributed to a number of factors including climatic change and the influx of Numic peoples (Fairley et al. 1994).

## **PROTOHISTORIC AND HISTORIC RESOURCES**

Very little information is available for the Grand Canyon region during the transition to the historic period. Between 1200-1600 Grand Canyon area inhabitants likely felt the indirect influence of Spanish explorers and traders in New Mexico. In 1540, Garcia Lopez de Cardenas came to the Grand Canyon seeking a waterway to the Gulf of California but left the region discouraged. Spanish influences probably increased during the Protohistoric period (1600-1776) with European colonies in what is now California and New Mexico. The explorations of Spanish friars Dominguez and Escalant, and the journey of Father Garcés in 1776 help define the beginning of the Historic period, and contact between native groups and incoming Europeans became increasingly common (Anderson 1998). Several modern Native American tribes are linked to archaeological remains in the Grand Canyon area from late prehistoric to historic times, including the Pai (Hualapai and Havasupai) who migrated from the Lower Colorado River, the Southern Paiute from the western Great Basin, and the Hopi who are descendant from the prehistoric Pueblos. The Navajo tribe also maintains a connection to the canyon. The Zuni retain a link to the Grand Canyon through a belief that the canyon is the place of their ancestral emergence into this world (Ahlstrom et al. 1993). Native American use of the Grand Canyon has continued into modern times.

Spanish control of the Grand Canyon region was ceded to Mexico following the Mexican revolution in 1821, but Mexican rule was short-lived. A war between Mexico and the United States ended with the signing of the Treaty of Guadalupe Hidalgo in 1848. The treaty gave possession of a huge western territory, including the Grand Canyon, to the United States, and opened the way for American expansion. Employee land surveyors soon arrived, as did prospectors and explorers such as John Wesley Powell, who made his first trip on the Colorado River in 1869. Stories of Powell's adventures served as an attraction to visitors and settlers from the East, and with increased settlement came more frequent contact and conflict between Euro-Americans and Native Americans.

In the 1880s, Atlantic and Pacific Railroad completed the railroad line that connected northern Arizona with the rest of the country and spurred the development of such towns as Holbrook, Winslow, Flagstaff, Williams, and Ash Fork. The railroad attracted economic investment in the region and facilitated the growth of mining, timbering, and ranching. Prospectors in the canyon searched for precious minerals. In the late nineteenth and early twentieth centuries, tourist operators began to develop roads and trails, often working from well-used Indian paths, and built accommodations around the Grand Canyon. Visitor facilities often consisted of rough buildings or simple canvas tents. Mining claims in the canyon were used both for actual mines and as a means of controlling land for tourist operations. In 1901, completion of the Grand Canyon Railway from Williams to the

South Rim of the Grand Canyon provided tourists with a fast, comfortable, and inexpensive means of traveling to the canyon.

In 1906, President Theodore Roosevelt declared portions of the canyon to be a federal game preserve, and, in 1908, he used the American Antiquities Act to establish the Grand Canyon National Monument. The U.S. Department of Agriculture Forest Service managed the monument until 1919 when it became a national park. The Forest Service worked closely with the Santa Fe Railroad and the Fred Harvey Company to provide accommodations and amenities for tourists. The railroad company invested the capital to build El Tovar Hotel, Hopi House, Hermits Rest, and a number of other buildings that are still an integral part of the Grand Canyon today. The Fred Harvey Company and the Harvey Girls managed the accommodations, meals, and saw to visitors' needs. During the early years, GRCA struggled to provide an adequate infrastructure of roads, employee housing, electricity, and water. A state-of-the-art sewage plant built in 1926 did provide the solution to a long-running sewage disposal problem. However, swelling tourism and inadequate infrastructure became a constant theme for much of the history of the park.

During the Great Depression, work relief agencies such as the Civilian Conservation Corps (CCC) completed many useful projects at the park including road building, maintenance, and construction. The CCC strung a transcanyon telephone line in 1936 and brought utilities to all the public buildings in Grand Canyon Village, Bright Angel Point, and Desert View. In 1932, the Santa Fe Railroad tackled the water scarcity problem by constructing a water system to pump 85 gallons per minute up 3,300 vertical feet from Indian Garden to the South Rim (Anderson 2000). With the advent of World War II, infrastructure investment declined, as did the number of tourists visiting the canyon. The years following the war's end produced a tourist boom, and South Rim resources were severely strained. Spending on accommodations, roads, and utilities did not keep pace with visitor demand. From the mid-1950s to the early 1980s, structural improvement under the plan took place on a massive scale to catch up with the constant increase in tourist visitation. The size of the park continued to change as well. Several land acquisitions occurred over the years until 1975 when GRCA reached its current boundaries.

## CULTURAL LANDSCAPE RESOURCES

In 1992, the *Secretary of the Interior's Standards for the Treatment of Historic Properties* were revised so that they could be applied to all historic resource types included in the NRHP including buildings, structure, sites, objects, districts, and landscapes. NPS defines a cultural landscape as "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values."

The employee housing area was surveyed in 1973 and 1994 (Pilles et al. 1973; Schroeder 1996). A prehistoric site, AZ B:16:105, is located approximately 50 feet south of the footprint for the proposed housing buildings. The site has been identified as a Cohonina habitation site. AZ B:16:105 has been recommended as eligible for inclusion on the NRHP as part of the GRCA multiple resource nomination based on its potential to yield significant information on human settlement and subsistence activity during the prehistoric period on the South Rim of the Grand Canyon (Schroeder 1996). There are no known historic sites within the employee housing site.

# 4 Environmental Consequences

NEPA requires that environmental documents disclose the environmental impacts of the proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided should the



proposed action be implemented. This section analyzes the environmental consequences of the alternatives on the impact topics. This analysis provides the basis for comparing the alternatives.

## **Methodology**

The impact analysis and conclusions contained in this chapter were based on Park staff knowledge of the resources and site; review of existing literature and Park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on natural and cultural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area.

Potential impacts in this chapter are described in terms of type (are the effects beneficial or adverse?), context (are the effects site-specific, local, or even regional?), duration (are the effects short-term or long-term?), and intensity (negligible, minor, moderate, or major). Because definitions of intensity can vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this EA.

For purposes of impact analysis in this Chapter, the following definitions of duration are used to characterize impacts discussed.

- Short-term – temporary effects typically confined to the construction period.
- Long-term – more permanent effects that will remain following construction.

## **Special Status Species**

For the purposes of the analyses for Mexican spotted owl, California condor, Southwestern willow flycatcher, Northern goshawk, and American peregrine falcon, determination of effects were described using the standard USFWS terminology for biological assessments.

## **Cultural Resources and Section 106 of the National Historic Preservation Act**

In this EA/AEF, impacts to cultural resources are described in terms of type, context, duration, and intensity, as described above, which is consistent with CEQ regulations that implement NEPA. These impact analyses are intended, however, to comply with the requirements of both NEPA and Section 106 of the National Historic Preservation Act (NHPA, 16 USC. 470f as revised on July 11, 2000). In accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 of the NHPA (36 CFR Part 800, Protection of Historic Properties), impacts to cultural resources were identified and evaluated by 1) determining the area of potential effects; 2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the NRHP; 3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed on the NRHP; and 4) considering ways to avoid, minimize or mitigate adverse effects.

Under the Advisory Council on Historic Preservation's regulations, a determination of effect is first made on the identified historic properties. If a "historic properties affected" determination is made, then an evaluation on whether or not the effect is adverse or not adverse is determined. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the NRHP, e.g., diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the preferred alternative that

would occur later in time, be farther removed in distance or be cumulative (36 CFR Part 800.5, Assessment of Adverse Effects). A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the NRHP.

CEQ regulations and NPS's Conservation Planning, Environmental Impact Analysis and Decision-making (DO-12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g., reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effects remain adverse.

A Section 106 summary is included in the impact analysis section for cultural resources under the preferred alternative. The Section 106 summary is intended to meet the requirements of Section 106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources, based on the criteria of effect and of adverse effect found in the Advisory Council on Historic Preservation's regulations.

## Cumulative Impact

Cumulative impact is defined as the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7). Therefore it is necessary to identify other ongoing or foreseeable future projects within Grand Canyon Village or surrounding areas. For this analysis, foreseeable future actions were considered to be actions that could occur in the vicinity of Grand Canyon Village within the next five years that currently have funding or for which funding is actively being sought. Five years was selected as the time frame for foreseeable future actions because most of the direct and indirect impacts of the proposal would occur within five years. Many of the foreseeable future actions are proposed in the 1995 GMP.

The projects that are in or near the Grand Canyon Village area and included in the cumulative impact analysis for each impact topic are listed below:

*Horace Albright Training Center.* The Horace Albright Training Center would be rehabilitated to better accommodate current training demands and modernize the facility to meet current NPS construction standards. Rehabilitation activities would include landscaping the grounds with native plants; replacement of deteriorated concrete walkways; resurfacing of entrance road and parking areas; replacement of water and sewer lines; remodeling the interiors of five eleven-unit apartment buildings; remodeling of Kowski Hall; construction of an addition to Kowski Hall; and the construction of a storage building at the northern end of Kowski Hall. The planning and environmental documentation for this project is complete. Implementation is expected to occur within the next year. Ground disturbance for this project is estimated at 0.25 acre.

*Greenway.* A paved pedestrian and bike path of about 0.6 kilometer (1 mile) has been constructed from the new Canyon View Information Plaza (CVIP) to Park Headquarters and is proposed from CVIP to Tusayan. Other segments of trail on the south rim are also being explored. All Greenway trail proposals would include the installation of lighting, signs, and benches. This pathway would be part of a larger Greenway system that would eventually link all major areas of the South Rim. Planning for this project is currently ongoing. Implementation of the CVIP to Headquarters segment is currently underway. Implementation of the CVIP to Tusayan segment is currently in the planning phase, and may occur within the next five years. Ground disturbance for this project is estimated at 2 acres.

*Emergency Services Facility.* This project proposes to construct a new emergency services building to house emergency medical services, structural fire protection, and search and rescue operations. This preferred location for this facility is the Clinic building. This proposal would include the construction of a parking area and access road in addition to a new building. Planning for this project is currently ongoing. Implementation may occur within the next five years. Ground disturbance for this project is estimated at 0.5 acre. Compliance has been completed.

*Grand Canyon Village Restrooms.* Construction or rehabilitation of restroom facilities may occur throughout the South Rim, including locations at Yavapai Observation Station and Bright Angel Trailhead in Grand Canyon Village. This would occur as part of a park-wide restroom restoration effort. Planning for this project is currently underway. Implementation would occur within the next five years. Ground disturbance for this project is estimated at 0.25 acre.

*Walkways.* Pedestrian walkways may be resurfaced to improve safety and universal accessibility. Walkways that would be improved include walkways around the General Store, Shrine of the Ages, and between Verkamp's store and Kolb Studio along the South Rim. Walkways within Mather Campground may also be addressed under this effort. Planning for this project is currently underway. Implementation would occur within the next five years. Ground disturbance for this project would generally be on existing trails and walks, but some new ground disturbance may be necessary and is estimated at 0.25 acre.

*Ranger Operations Building.* Interior and exterior restoration of the historic ranger operations building would occur under this project. Plumbing, electrical, and mechanical systems would be updated. Windows would be repaired or replaced. Interiors would be updated with new walls, floors, ceilings, and light fixtures. A fire suppression and security system would be installed. The roof, exterior siding, and log ends would be repaired. Stonework would be repaired and repointed. Planning for this project is currently underway. Implementation would occur within the next five years. There would essentially be no new ground disturbance for this project.

*Pinyon Park Housing.* New housing units may be constructed to replace existing trailers at the Pinyon Park housing area. Planning for this project has not yet begun. Implementation may occur within the next five years. Ground disturbance for this project is estimated at 0.5 acre.

*Heritage Education Campus (HEC).* One National Landmark structure and four other National Register buildings near the powerhouse area of the historic district may be converted to interpretive and classroom space for the HEC. This would entail relocation of functions currently utilizing these buildings and renovation. Planning for this project has not yet begun. Implementation may occur within the next five years. The HEC would utilize an area within the Village that is already developed with parking areas and buildings, etc. Some minor conversion of undisturbed land to developed land may result and is estimated at 0.25 acre.

*Yavapai Observation Station.* Currently the Yavapai Observation Station is used as a bookstore. This building would be rehabilitated, including returning it to its original use, which was a geological interpretative facility. Rehabilitation would include interior and exterior repairs. Planning is currently underway for this project. Implementation may occur within the next five years. There would be no new ground disturbance as a result of this project.

*Park Headquarters/Visitor Center.* The Canyon View Information Plaza would replace the visitor center function at the park headquarters/visitor center building. This project would convert the extra space vacated by the visitor center function to administrative space, and would include additions to the building. Rehabilitation of the entire building would also occur with this project. This would include upgrading the heating and cooling systems, doors, windows, insulation, roofing, electrical, data communications, and mechanical systems. The rehabilitation would also include the installation of a fire sprinkler system and rehabilitation of the exterior to a historically accurate finish. Planning is currently underway for this project. Implementation may occur within the next 5 years. Ground disturbance for this project is estimated at 0.5 acre.

*Mather Campground Rehabilitation.* The campground rehabilitation would include 11 new campsites and removal of 9 campsites, constructing approximately 900 feet of a one-lane asphalt road, bringing the campground up to current accessibility standards, redesigning the campground entrance, and rehabilitating the restrooms. Ground-disturbing activities encompass approximately 1.5 acres. Planning is currently underway for this project. Implementation may occur within the next five years.

## Impairment

In addition to determining the environmental consequences of the preferred and other alternatives, NPS policy (*Management Policies* 2001) requires analysis of potential effects to determine whether or not actions would impair GRCA resources.

The fundamental purpose of the national GRCA system, established in the NPS Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve GRCA resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on GRCA resources and values. However, the laws do give NPS the management discretion to allow impacts to GRCA resources and values when necessary and appropriate to fulfill the purposes of GRCA, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given NPS the management discretion to allow certain impacts within GRCA, that discretion is limited by the statutory requirement that NPS must leave the park's resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of GRCA resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any GRCA resource or value may constitute an impairment. An impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA;
- key to the natural or cultural integrity of GRCA or to the opportunities for enjoyment of the GRCA; or
- identified as a goal in GRCA's general management plan or other relevant NPS planning document.

Impairment may result from NPS activities in managing GRCA, visitor activities, or activities undertaken by concessioners, contractors, and others operating in GRCA. A determination on impairment is made for every impact topic in each alternative.

## Regulations and Policy

As with all units of the National Park System, management of GRCA is guided by the 1916 Organic Act; the General Authorities Act of 1970, and the act of March 27, 19788, relating to the management of the National Park System; *NPS Management Policies*, 2001, and other applicable federal laws and regulations including but not limited to:

- **National Park Service Organic Act of 1916**  
(PL Chapter 408, 39 Stat 535 et seq., 16 USC 1)  
Through this act, Congress established NPS and mandated that it "shall promote and regulate the use of the federal areas known as national parks, monuments, and reservations ... by such means and measures as to conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of future generations." The Organic Act authorizes the Secretary of the Interior to promulgate

rules and regulations necessary for management of the parks. This authority, among others, provides the basis for the regulations in 36 CFR 1.

- **Clean Air Act of 1963**

(PL chapter 360, 69 Stat 322m 42 USC et seq.)

The main purpose of this act is to protect and enhance the nation's air quality to promote the public health and welfare. The act establishes specific programs that provide special protection for air resources and air quality-related values (AQRVs) associated with NPS units. For example, sections 160-169 of the act establish a program to prevent significant deterioration (PSD) of air quality in clean air regions of the country. The purposes of the PSD program include 1) to protect resources that might be sensitive to pollutant concentrations lower than the established national standards, and 2) to "preserve, protect and enhance the air quality in national parks, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic or historic value." In section 169A of the act, Congress also established a national goal of remedying any existing and preventing any future manmade visibility impairment in mandatory Class 1 areas.

- **National Environmental Policy Act of 1969 (NEPA)**

(PL 91-190, 42 USC 4321 et seq., 83 Stat 852, 42 USC 4332 as amended)

NEPA is the basic national charter for environmental protections. It contains an "action-forcing" provision to ensure that federal agencies act according to the letter and spirit of the law. Among its provisions, this act declares that it is the policy of the federal employee to "preserve important historic, cultural, and natural aspects of our national heritage." NEPA directs that all practicable means should be used to improve federal functions so that the nation may "... attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences ..." Title I of NEPA requires that federal agencies plan and carry out their activities "... so as to protect and enhance the quality of the environment. Such activities shall include those directed to controlling pollution and enhancing the environment." To enact this policy, NEPA requires an interdisciplinary study of the impacts associated with federal programs.

- **General Authorities Act of 1970**

(PL 91-383 sec.1. 84 Stat 825,16 USC 1a et seq.)

This act affirmed that all NPS units, including historic sites, recreation areas, etc., while acknowledged to be "distinct in character, were united through their inter-related purposes and resources into one national park system as cumulative expressions of a single national heritage." The purpose of this act was "to include all such areas in the system and to clarify the authorities applicable to the system." The act made it clear that the National Park Service Organic Act and other protective mandates applied equally to all units of the system. Further amendments stated that NPS management of park units should not be conducted "in derogation of the purposes and values for which these various areas have been established."

- **Federal Water Pollution Control Act (Clean Water Act of 1972)**

(PL 92-500, PL 100-433, 86 Stat 816, USC 9 sec.1251 et seq., as amended, 33 USC sec.1251-1376, and 1987 Federal Water Quality Act)

This act firmly establishes federal regulation of the nation's waters, and contains provisions designed to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The act requires that the states set and enforce water quality standards to meet Environmental Protection Agency (EPA) minimum guidelines. It establishes effluent limitations for point sources of pollution, requires a permit for point source discharges of dredged or fill material, and authorizes a "National Wetlands Inventory." Recent changes brought about by the 1987 Federal Water Quality Act places greater emphasis on toxicological-based criteria and on-site biological monitoring.

- **Endangered Species Act of 1973**

(PL 93-205, 87 Stat 884, 7 USC 136, as amended)

This act requires federal agencies to ensure that their activities (authorized, funded, or carried out) will not jeopardize existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species.

- **Redwood National Park Act of 1978**

(PL 95-250, 92 Stat 163, as amended, 1978)

This act amended NPS legislation to direct that within the National Park System, “authorization of activities shall be construed and the protection, management, administration ... shall not be exercised in derogation of the values and purposes for which these various areas have been established ...” With this additional amendment to NPS law NPS is mandated to afford the highest standard of protection and care to park resources; no decision can compromise these resource values, except where specifically authorized by law.

- **Wilderness Act of 1984**

(PL 88-577, 78 Stat 890, 16 USC 1131 et seq.)

This act established the National Wilderness Preservation System, composed of congressionally designated federally owned areas. Federal agencies are required to administer these areas to provide for their use and enjoyment, now and in the future, and to protect and preserve their wilderness character.

- **Invasive Species - Executive Order 13112**

This executive order requires federal agencies to not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species, unless the federal agency has determined that the benefits of such actions clearly outweigh the potential harm caused by invasive species. This executive order also requires federal agencies to undertake feasible and prudent measures to minimize risk of harm from invasive species as a result of agency actions.

- **Arizona Revised Statutes R18-2-15 (Environmental Quality – Air Pollution Control))**

This statute establishes requirements to 1) obtain state permits to conduct management-ignited fires, and 2) implement control measures to reduce air pollution from those fires.

- **Regional Haze Rule**

(40 CFR Part 51)

This rule establishes the program goals that tribes and states must follow to return Class I areas to the natural visibility conditions required under the Clean Air Act.

## Natural Resources

### VEGETATION

#### METHODOLOGY

The baseline information used to assess impacts to vegetation is as described in the methodology section and includes Park staff knowledge of the resources and site; review of existing literature and Park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on natural and cultural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area. Additional sources of information on vegetation used as a basis for this evaluation are as described above in the affected environment section.

The thresholds of change for the intensity of an impact to vegetation are defined as follows:

*Negligible* – a change to a biotic community that is not measurable or perceptible.

*Minor* – a measurable or perceptible, small, localized change to a biotic community. The change is of little consequence.

*Moderate* – a change to a biotic community that is measurable and of consequence but is localized.

*Major* – a measurable change to a biotic community. The change is large and/or widespread and could have permanent consequences for the species or resource.

#### ALTERNATIVE A – NO ACTION

*Direct/Indirect Impacts.* The no action alternative would not implement any ground-disturbing activities and, therefore, there would be no new impacts to the vegetation at the new employee housing site.

*Cumulative Impacts.* In addition to the existing habitat lost due to developments, roads, and utility corridors, loss of ponderosa pine-pinyon-juniper habitat type would occur due to foreseeable future developments in and around Grand Canyon Village. The extent of this loss is unknown because preliminary site designs for the future developments have not occurred. However, habitat loss would probably be minor in context with the substantial acres of ponderosa pine-pinyon-juniper type present within GRCA. In addition to loss of habitat, the cumulative impacts of implementing this alternative would be decreased wildlife security, increased disturbance to adjacent habitat, and increased fragmentation. However, these impacts, in combination with other past, present, and foreseeable future actions, would be minor in intensity, adverse and long-term because they would primarily occur in areas currently degraded due to high disturbance levels from existing developments, roads, utility corridors, and human use.

*Impairment.* The no action alternative would be expected to have no direct or indirect impacts. The cumulative impacts (due to other foreseeable future development) could consist of minor, long-term adverse impacts on ponderosa pine-pinyon-juniper habitat due to the removal of small numbers of trees in some areas to accommodate buildings and related improvements. These impacts would not constitute impairment because they would not prevent NPS from fulfilling the purpose of GRCA or preclude the opportunities for enjoyment of the GRCA. In addition, minor losses of this habitat type would not harm the integrity of GRCA due to the common occurrence of this habitat type in the park. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of

the GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* No direct/indirect impacts would be expected due to the no action alternative. Cumulative impacts would be considered to be minor, long-term adverse impacts because any activities would primarily occur in areas where vegetative communities are already degraded.

### **ALTERNATIVE B – PREFERRED**

*Direct/Indirect Impacts.* Construction activities at the employee housing site would disturb approximately 1.2 acres of Pinyon-Juniper habitat. Wherever practical, soils and plants affected by construction would be salvaged for use in site restoration. Site restoration would be included for all newly disturbed areas (including areas where new utilities are necessary).

The employee housing site would be cleared and grubbed to construct the proposed facilities. Any equipment yards or other construction-related activities would occur within the designated limits of disturbance. No construction vehicle movement would occur outside the construction access limits. Vegetation would be preserved and protected outside of the specified clearing limits. Slashings (tree trunks, branches, stumps, and other vegetation) and excess rock and soil material resulting from clearing operations would be deposited in sites approved by NPS. Brush or roots would be chipped and spread at the approved sites in a natural, unobtrusive manner. Revegetation would include all areas disturbed by the construction of the proposed facilities. Native species adapted to the area would be used in all areas of disturbance. Any fill, seed, or mulch material brought in from off-site would be free of invasive species, and construction equipment would be free of invasive species and toxic materials.

The construction of the employee housing buildings and associated infrastructure would have a long-term, minor adverse direct and indirect impacts on pinyon-juniper habitat because of the relative small number of trees removed compared to the acres of similar habitat within GRCA.

*Cumulative Impacts.* The cumulative impacts of the construction of the employee housing facility combined with past, present, and foreseeable future actions to biotic communities would be similar to those described in the previous section describing direct/indirect impacts. Any cumulative impact due to increased habitat loss would be considered minor in intensity, adverse long-term impacts in context with the abundance of ponderosa pine-pinyon-juniper habitat type present within GRCA.

*Impairment.* This alternative would have minor direct, indirect, and cumulative impacts on pinyon-juniper habitat due to the removal of trees in some areas to accommodate buildings and related improvements. These impacts would not constitute impairment and would not prevent NPS from fulfilling the purpose of GRCA or preclude the opportunities for enjoyment of GRCA. In addition, minor losses of this habitat type would not harm the integrity of the GRCA due to the common occurrence of this habitat type at GRCA. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* A total of approximately 1.2 acres of habitat would be disturbed for the construction of the employee housing facility. Removal of existing trees and other vegetation would be required. Where possible, existing vegetation would be removed by trained experts and replanted in order to revegetate areas disturbed by this alternative. Overall direct, indirect, and cumulative impacts to biotic communities would be minor in intensity, adverse long-term impacts due to the relative small loss of habitat and the common occurrence of the pinyon-juniper habitat.



## **EXOTIC VEGETATION AND NOXIOUS WEEDS**

### **ALTERNATIVE A – NO ACTION**

*Direct/Indirect Impacts.* The no action alternative would not implement any ground-disturbing activities and, therefore there would be no risk to the spread of exotic vegetation and noxious weeds.

*Cumulative Impacts.* Ongoing exotic vegetation control programs would continue, including hand pulling, mechanical treatments, and a small amount of herbicide control. However, due to the size of the current program (mostly volunteer work) existing populations of exotic vegetation would continue to slowly spread and replace native vegetation. This would most likely occur along roads and utility corridors. Proposed foreseeable future developments would create approximately 15 to 20 acres of disturbed area. Exotic vegetation and noxious weeds generally invade disturbed sites, and thus future developments would increase the potential for spread or introduction of exotic vegetation and noxious weeds. Project-specific mitigation measures would be implemented for these future projects to reduce the potential for spread or introduction of exotic vegetation, therefore cumulative impacts would be minor in intensity, adverse, and long-term.

*Impairment.* For reasons described above, the no action alternative would have no direct or indirect impacts, and would have only a potential long-term, adverse minor cumulative impact (due to other foreseeable future development). These impacts from exotic vegetation would not constitute impairment. Although not desirable, minor increases in exotic vegetation would not prevent NPS from fulfilling the purpose of GRCA or preclude the opportunities for enjoyment of GRCA. In addition, minor increases in exotic vegetation would not harm the natural integrity of the GRCA because it would be limited in extent. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of the GRCA's resources or values.

*Conclusion.* No direct or indirect impacts would be expected due to the no action alternative. Cumulative impacts (due to other foreseeable future development) would be of long-term adverse impacts of minor intensity, and would include the continued spread of existing populations and minor increase in risk of spread or introduction of exotic vegetation.

### **ALTERNATIVE B – PREFERRED**

*Direct/Indirect Impacts.* Ground disturbance created by the construction of the new employee housing facilities would increase the potential for the introduction of exotic plant species at the new employee housing sites. However, mitigation measures implemented with the preferred alternative would reduce the risk of spreading and introducing different species to the sites. Pressure washing of ground-disturbing equipment would substantially reduce the risk of introducing a new invader. Post-construction revegetation, monitoring, and treatment would substantially reduce the risk of spread of existing populations and introduction of a new invader. For these reasons, direct and indirect impacts under this alternative would be negligible.

*Cumulative Impacts.* Ground disturbance associated with past, present, and foreseeable future developments would increase the potential for the spread or introduction of exotic vegetation. However, preventive and mitigation measures associated with all the development projects would substantially reduce the risk of spreading or introducing exotic vegetation. The ongoing exotic vegetation control program at GRCA would be augmented with project-related prevention, mitigation, and post-treatment activities. This should keep existing populations in check and eliminate any new invaders and would constitute an improvement over existing exotic vegetation control. For these reasons, cumulative impacts associated with the Alternative B would be considered negligible in intensity, long-term adverse impacts.

*Impairment.* Direct, indirect, and cumulative impacts from exotic vegetation resulting from this alternative would be negligible. These impacts would not constitute impairment. Although not desirable, any increases in exotic vegetation would not prevent the from fulfilling the purpose of GRCA or preclude the opportunities for enjoyment of GRCA. In addition, minor increases in exotic vegetation would not harm the natural integrity of GRCA because it would be limited in extent. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* Mitigation measures associated with the project should be sufficient to ensure exotic vegetation does not become a major concern at the new employee housing site. Augmented exotic vegetation control measures would provide an improvement to existing controls. For these reasons, direct, indirect and cumulative impacts under the preferred alternative would be considered negligible in intensity, long-term adverse impacts.

## **WILDLIFE AND SPECIES OF SPECIAL CONCERN**

### **METHODOLOGY**

The baseline information used to assess impacts to wildlife and special status species is as described in the methodology section and includes Park staff knowledge of the resources and site; review of existing literature and Park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on natural and cultural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area. Additional sources of information on wildlife used as a basis for this evaluation are as described above in the affected environment section.

The thresholds of change for the intensity of an impact on wildlife populations are defined as follows:

*Negligible* – no impacts to general wildlife populations or listed special status species or impacts that are only temporary in effect are expected. These temporary effects would be short term, localized, and not perceptible. For purposes of section 7 under the Endangered Species Act, the determination of effect would be *no effect* to listed species or their habitat.

*Minor* – a measurable but small, localized change to a population or individuals of a species or to designated critical habitat. The change is of little consequence, but is not discountable. For purposes of section 7 under the Endangered Species Act, the determination of effect would be *may affect, but is not likely to adversely affect* to listed species or their habitat.

*Moderate* – a change to a population or individuals of a species or to a designated critical habitat. The change is measurable and of consequence, but localized. The change is not expected to threaten the continued existence of the listed species within the park. For purposes of section 7 under the Endangered Species Act, the determination of effect would either be *may affect, but is not likely to adversely affect* listed species or their habitat or *may affect, likely to adversely affect listed species* or their habitat.

*Major* – a measurable and large and/or widespread change to a population or individuals of a species or to designated critical habitat. The change could threaten the continued existence of the species in the park. For purposes of section 7 under the Endangered Species Act, the determination of effect would be *may affect, likely to adversely affect* listed species or their habitat.

## **MEXICAN SPOTTED OWL**

### **ALTERNATIVE A – NO ACTION**

*Direct/Indirect Impacts.* No vegetation manipulation or construction activities are proposed under the no action alternative. Therefore the existing condition would remain the same. No Mexican spotted owl habitat would be altered, and no new sources of disturbance would be introduced with this alternative. There would be no direct or indirect effect to Mexican spotted owls associated with this alternative.

*Cumulative Impacts.* Ongoing activities at Grand Canyon Village create year-round disturbance in the vicinity. This continual disturbance has decreased the quality of habitat in and around Grand Canyon Village for Mexican spotted owls. Foreseeable future developments might affect spotted owl habitat through loss of foraging habitat and increased disturbance during construction. However, the loss of foraging habitat is unlikely to affect the spotted owl because foraging habitat in Grand Canyon Village is of marginal quality due to the high level of existing development, roads, and human use. In addition, relative to the amount of available foraging habitat, the area affected would be negligible, and the forest community types within a 1-mile radius of Grand Canyon Village are not considered quality nesting or roosting habitat. The system of trails associated with the Greenway would have a higher potential of affecting spotted owls. The Greenway would potentially concentrate hikers and bikers near potential nesting and roosting habitat, but until more site specific designs are developed, it is difficult to determine the level of disturbance on potential nesting and roosting habitat. Until the presence of spotted owls can be definitively determined, mitigation measures to avoid disturbance from construction activities during breeding season would be implemented. Therefore, the cumulative effect of the no action alternative, in combination with past, present, and other foreseeable future developments, would be considered no effect on the Mexican spotted owl or its habitat.

*Impairment.* The no action alternative would have no direct, indirect or cumulative effects to the species or habitat. There would be no major impact to prevent NPS from fulfilling the purpose of GRCA or preclude the opportunities for enjoyment of GRCA, nor harm the natural integrity of GRCA. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of the GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* The no action alternative would have no direct, indirect, or cumulative effect on the Mexican spotted owl, because foraging habitat that might potentially be lost is of marginal quality due to the high level of existing development, roads, and human use, and because mitigation measures to limit disturbance due to construction activities would be taken.

### **ALTERNATIVE B – PREFERRED**

*Direct/Indirect Impacts.* Removal of some existing trees and other vegetation would be required at the new employee housing site with the disturbance to approximately 1.2 acres of forested land. It is unlikely that this loss of potential foraging habitat would adversely affect any spotted owls because no owls have been seen in the immediate vicinity of Grand Canyon Village. The employee housing site is considered not to have suitable owl habitat characteristics, and the foraging habitat that would be lost is currently of marginal quality due to high disturbance levels from adjacent existing developments, roads, and human use. In addition, relative to the amount of available foraging habitat within GRCA, the amount lost would be negligible.

Equipment that would most likely be used during construction (such as bull-dozers and excavators) produce noise levels of about 85 dBA<sup>1</sup> at 50 feet that dissipate to 49-55 dBA at 0.5 mile, which is equivalent to noise levels

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<sup>1</sup> DBA refers to the sound levels measured in decibels on the A-scale of a sound meter. A-weighting of decibels is related to how the human ear responds to different frequencies.

typically found in libraries (Minnesota Pollution Control Agency 1999). Any Mexican spotted owls occupying habitat 0.5 mile or more from either site would be habituated to such routine noise levels, and would likely not be disturbed (E. Leslie, GRCA, pers. comm. 2001).

The nearest currently known occupied suitable Mexican spotted owl habitat is located in the Pipe Spring area, approximately 2.5 miles to the northeast of the employee housing site. Trees and uneven terrain between the project sites and Pipe Spring would likely reflect some sound waves; although, in general at this distance, noise levels are unlikely to disrupt spotted owl activities. However, because there is some uncertainty about the presence or absence of owls throughout GRCA, potential impacts still exist but would likely be discountable. Therefore, the construction of the employee housing facility may affect the Mexican spotted owl, but is not likely to adversely affect the Mexican spotted owl, or its habitat.

*Cumulative Impacts.* Ongoing activities at Grand Canyon Village create year-round disturbance in the vicinity. Foreseeable future developments might affect spotted owl habitat through loss of foraging habitat and increased disturbance during construction. However, the loss of foraging habitat is unlikely to affect the spotted owl because foraging habitat is marginal quality due to the high level of existing development, roads, and human use. In addition, relative to the amount of available foraging habitat, the area affected would be negligible, and the forest community types within a one-mile radius of the Grand Canyon Village area are not considered quality nesting or roosting habitat. The trails associated with the Greenway would have a higher potential of affecting spotted owls. The Greenway would probably concentrate hikers and bikers near potential nesting and roosting habitat, but until more site-specific designs are developed, it is difficult to determine the level of disturbance on potential nesting and roosting habitat. Until the presence of spotted owls can be definitively determined, mitigation measures to limit any blasting activities, if required, during breeding season would be implemented. These mitigation measure would apply both for the work proposed under this alternative and for other foreseeable future development. Because there is some uncertainty about the presence or absence of owls throughout GRCA, potential impacts still exist but would likely be discountable. Therefore, the construction of the employee housing facility in combination with past, present, and foreseeable future development may affect the Mexican spotted owl, but is not likely to adversely affect the Mexican spotted owl, or its habitat.

*Impairment.* Direct, indirect, and cumulative impacts from the construction of the employee housing facility may affect the Mexican spotted owl, but is not likely to adversely affect the Mexican spotted owl, or its habitat. There would be no major impact to prevent NPS from fulfilling the purpose of GRCA or preclude the opportunities for enjoyment of GRCA, nor harm the natural integrity of GRCA. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* Direct, indirect, and cumulative impacts of the construction of the employee housing may affect but is not likely to adversely affect Mexican spotted owls or its habitat, and because measures to mitigate potential disturbance to nesting owls would be taken under this preferred alternative and under other foreseeable future developments

## **CALIFORNIA CONDOR**

### **ALTERNATIVE A – NO ACTION**

*Direct/Indirect Impacts.* No vegetation manipulation or construction activities are proposed under the no action alternative. Therefore the existing condition would remain the same. No California condor habitat would be impacted, and no new sources of disturbance would be introduced with this alternative. There would be no direct or indirect affect to California condor or its habitat associated with this alternative.

*Cumulative Impacts.* Existing developments create year-round human presence in the vicinity of Grand Canyon Village. Construction activities often attract California condors, which could lead to an increase in the potential for interactions between condors and humans. Such interactions would be of concern if visitors or construction workers harass the birds or if the birds become habituated to humans. In addition, excessive noise within one mile of roosting, perching, or foraging condors has the potential to disrupt California condor activity. Currently, there are many known roosts, perches and foraging areas for condors within 1 mile of the Grand Canyon Village area. Cumulative impacts as result of implementing the no action alternative, combined with other past, present, and reasonably foreseeable future projects, may affect, but is not likely to adversely affect the California condor or its habitat.

*Impairment.* The no action alternative would be expected to have no direct or indirect impacts. The cumulative impacts (due to other foreseeable future development) may affect, but is not likely to adversely affect the California condor or its habitat for reasons described above. There would be no major impact to prevent NPS from fulfilling the purpose of GRCA or preclude the opportunities for enjoyment of GRCA, nor would they harm the natural integrity of GRCA. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of the GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* The no action alternative would have no direct or indirect impacts on the California condor. Cumulative impacts as result of implementing the no action alternative, combined with other past, present, and reasonably foreseeable future projects, may affect, but is not likely to adversely affect the California condor or its habitat.

## **ALTERNATIVE B – PREFERRED**

*Direct/Indirect Impacts.* Impacts to nesting or roosting habitat is not of concern because the only potential nesting and roosting habitat near Grand Canyon Village is below the rim, and there is no proposal to affect the habitat or increase visitor use below the rim. The project would result in modification of suitable perching/roosting habitat by the removal of approximately 5 ponderosa pine trees, 62 juniper trees, and 241 pinyon pine trees, as well as ground disturbance to approximately 1.2 acres of suitable foraging habitat, which would be permanently lost. However, the main concern with California condors would be contact with humans. Condors are naturally curious and will frequent areas with high human activity, such as the Grand Canyon Village. Construction activities often attract condors, which could lead to an increase in the potential for interactions between condors and humans. Such interactions would be of concern if visitors or construction workers harass the birds or if the birds become habituated to humans. In addition, excessive noise (such as blasting) within 1 mile of roosting, perching, or foraging condors has the potential to disrupt California condor activity.

Increased human activity at the project site once construction is completed is reasonably certain to occur, and could increase the potential for condor-human interactions at the employee housing site. Some of these interactions could be detrimental for condors. Therefore, the project may affect the California condor, but is not likely to adversely affect the California condor or its habitat.

*Cumulative Impacts.* Existing developments create year-round human presence in the vicinity of the Grand Canyon Village. Construction activities often attract California condors, which could lead to an increase in the potential for interactions between condors and humans. Such interactions would be of concern if visitors or construction workers harass the birds or if the birds become habituated to humans. In addition, excessive noise within 1 mile of roosting, perching, or foraging Condors has the potential to disrupt California condor activity. Currently, there are many known roosts, perches, and foraging areas for condors within 1 mile of the Grand Canyon Village area. Cumulative impacts as result of constructing the employee housing facility, combined with

other past, present, and reasonably foreseeable future projects, may affect, but is not likely to adversely affect the California condor or its habitat.

*Impairment.* Potential impacts from the construction of the employee housing facility would not constitute impairment because there would be no major impact to prevent NPS from fulfilling the purpose of GRCA or preclude the opportunities for enjoyment of GRCA. In addition, these potential impacts would not harm the natural integrity of GRCA. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of the GRCA or to opportunities for enjoyment of the GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* The construction of the employee housing and other foreseeable future developments would result in modification of suitable perching, roosting, and foraging habitat, and could result in "take" of individual Condors due to excessive noise, or harassment by visitors or construction workers. However, condors are a wide ranging species, and the amount of foraging and perching/roosting habitat that would be modified is insignificant when compared to habitat currently available for condors throughout their Arizona range. Furthermore, "take" due to negative human-condor interactions is unlikely to occur due to mitigation measures that would be employed to prevent such interactions. Therefore, the construction of the employee housing facility in addition to foreseeable future developments may affect the California condor, but is not likely to adversely affect the California condor, or its habitat.

## **NORTHERN GOSHAWK**

### **ALTERNATIVE A – NO ACTION**

*Direct/Indirect Impacts.* No vegetation manipulation or construction activities are proposed under the no action alternative. Therefore the existing condition would remain the same. No Northern goshawk habitat would be impacted, and no new sources of disturbance would be introduced with this alternative. There would be no direct or indirect impacts to Northern goshawk associated with this alternative.

*Cumulative Impacts.* Existing developments create year-round human presence in the vicinity of Grand Canyon Village. Suitable habitat for the Northern goshawk exists within the area of Grand Canyon Village and foreseeable future developments would result in the loss of foraging habitat and increased disturbance during construction. The system of trails associated with the Greenway would have a higher potential of affecting Northern goshawks. The Greenway would potentially concentrate hikers and bikers near potential nesting and roosting habitat, but until more site-specific designs are developed, it is difficult to determine the level of disturbance on potential nesting and roosting habitat. Therefore, the cumulative effect of the no action alternative, in combination with past, present, and other foreseeable future developments, may impact individual Northern goshawks, but is not likely to result in a trend toward federal listing as a threatened or endangered species or loss of viability.

*Impairment.* The no action alternative would be expected to have no direct or indirect impacts on the Northern goshawk. The cumulative impacts (due to other foreseeable future development) may impact individual goshawks but is not like to result in federal listing as a threatened or endangered species. Because potential impacts would not be major, they would not constitute impairment or prevent NPS from fulfilling the purpose of GRCA or preclude the opportunities for enjoyment of GRCA, nor would they harm the natural integrity of GRCA. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of the GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* The no action alternative would have no direct or indirect impacts on the Northern goshawk. Cumulative impacts as result of implementing the no action alternative, combined with other past, present, and reasonably foreseeable future developments, may impact individual Northern goshawks, but is not likely to result in a trend toward federal listing as a threatened or endangered species or loss of viability.

### **ALTERNATIVE B – PREFERRED**

*Direct/Indirect Impacts.* The construction of the new employee housing facility would result in adverse modification of suitable goshawk nesting and perching/roosting habitat by the removal of approximately 241 pinyon pine trees, 62 juniper trees and 5 ponderosa pines. There would be ground disturbance to approximately 1.2 acres of suitable foraging habitat, most of which would be permanently lost. In addition, the project construction would involve operation of heavy equipment. Equipment that would most likely be used during construction produces noise levels that dissipate to about 49-55 dBA at 0.5 mile. Any Northern goshawks occupying habitat 0.5 mile or more from the employee housing site would be habituated to such routine noise levels and would likely not be disturbed. The nearest known occupied habitat is located within 1 mile of the employee housing site. However, trees and uneven terrain between the employee housing site and the nearest known occupied habitat would likely reflect some sound waves, which could intensify noise levels at this site and potentially disrupt Northern goshawk breeding activities. Increased human activity at the project sites once construction is completed is reasonably certain to occur, which could increase the potential for activities that disrupt the normal behavior of goshawks occurring in the area. Therefore, the construction of the employee housing facility may impact individual Northern goshawks, but is not likely to result in a trend toward federal listing as a threatened or endangered species, or loss of viability.

*Cumulative Impacts.* Existing developments create year-round human presence in the vicinity of Grand Canyon Village. Suitable habitat for the Northern goshawk exists within the area of Grand Canyon Village and foreseeable future developments would result in the loss of foraging habitat and increased disturbance during construction. The system of trails associated with the Greenway would have a higher potential of affecting Northern goshawks. The Greenway would potentially concentrate hikers and bikers near potential nesting and roosting habitat, but until more site-specific designs are developed, it is difficult to determine the level of disturbance on potential nesting and roosting habitat. Therefore, the cumulative effect of the construction of the employee housing facility, in combination with past, present, and other foreseeable future developments, may impact individual Northern goshawks, but is not likely to result in a trend toward federal listing of the goshawk as a threatened or endangered species or a loss of species viability.

*Impairment.* The construction of the employee housing facility would not prevent NPS from fulfilling the purpose of GRCA, preclude the opportunities for enjoyment of the GRCA, or harm the natural integrity of GRCA. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* The construction of the employee housing and foreseeable future developments would result in modification to suitable Northern goshawk habitat and could potentially disrupt the activities of Northern goshawks in the area due to excessive noise disturbance. Therefore, the employee housing facility and foreseeable future developments may impact individual Northern goshawks, but are not likely to result in a trend toward federal listing of goshawk as a threatened or endangered species or a loss of species viability.

## **PEREGRINE FALCON**

### **ALTERNATIVE A – NO ACTION**

*Direct/Indirect Impacts.* No construction activities are proposed under the no action alternative. Therefore the existing condition would remain the same. No peregrine falcon habitat would be impacted, and no new sources of disturbance would be introduced with this alternative. There would be no direct or indirect impacts to peregrine falcons associated with the no action alternative.

*Cumulative Impacts.* Ongoing activities at Grand Canyon Village create year-round disturbance in the vicinity. This continual disturbance appears not to be affecting the peregrine eyrie in the vicinity of the Grand Canyon Village so it is likely the falcons have become adapted to the disturbance. Suitable foraging habitat for the peregrine falcon exists within the area of the Grand Canyon Village and foreseeable future developments would result in the loss of foraging habitat and increased disturbance during construction. The system of trails associated with the Greenway would have a higher potential of affecting peregrine falcons. The Greenway would potentially concentrate hikers and bikers near potential foraging habitat, but until more site-specific designs are developed, it is difficult to determine the level of disturbance on potential foraging habitat. None of the foreseeable future developments would affect nesting habitat below the rim. Therefore, the cumulative effect of the no action alternative, in combination with past, present, and other foreseeable future developments, may impact individual peregrine falcons, but is not likely to result in a trend toward federal listing as a threatened or endangered species or loss of viability.

*Impairment.* The no action alternative would have no impacts on the peregrine falcon. There would be no impairment because NPS would not be hindered from fulfilling the purpose of GRCA. Opportunities for enjoyment of GRCA would not be precluded, nor would there be harm to the natural integrity of the GRCA. Because there would be no impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* The no action alternative would have no direct or indirect impacts on the peregrine falcon. Cumulative impacts as result of implementing the no action alternative, combined with other past, present, and reasonably foreseeable future developments, may impact individual peregrine falcons, but is not likely to result in a trend toward federal listing as a threatened or endangered species or loss of viability.

### **ALTERNATIVE B – PREFERRED**

*Direct/Indirect Impacts.* The construction of the employee housing facility would result in modification to approximately 1.2 acres of suitable peregrine falcon foraging habitat, most of which would be permanently lost. Construction activities would also result in the removal of approximately 241 pinyon pine trees, 62 juniper trees and 5 ponderosa pines that could be used as perching/roosting sites, although peregrines typically perch/roost on cliffs. In addition, the construction of the employee housing facility would involve operation of heavy equipment. As previously discussed, equipment that would most likely be used during construction produces noise levels that dissipate to about 49-55 dBA at 0.5 mile, assuming no obstructions reflect the sound. Any peregrine falcons occupying habitat 0.5 mile or more from the project sites would be habituated to such routine noise levels, and would likely not be disturbed. The nearest known active territory is located within one mile of the employee housing site; however, trees and uneven terrain between the site and this territory would likely reflect some sound waves, which could intensify noise levels at this site and potentially disrupt peregrine falcon breeding activities. Increased human activity at the project sites once construction is completed is reasonably certain to occur, which could increase the potential for activities that disrupt the normal behavior of peregrine falcons occurring in the



immediate area. Therefore, the construction of the employee housing site may impact individual peregrine falcons, but is not likely to result in a trend toward federal listing of the falcon as a threatened or endangered species, or a loss of species viability.

*Cumulative Impacts.* Ongoing activities at Grand Canyon Village create year-round disturbance in the vicinity. This continual disturbance appears not to be affecting the peregrine eyrie in the vicinity of Grand Canyon Village so it is likely the falcons have become adapted to the disturbance. Suitable foraging habitat for the peregrine falcon exists within the area of Grand Canyon Village and foreseeable future developments would result in the loss of foraging habitat and increased disturbance during construction. The system of trails associated with the Greenway would have a higher potential of affecting peregrine falcons. The Greenway would potentially concentrate hikers and bikers near potential foraging habitat, but until more site-specific designs are developed, it is difficult to determine the level of disturbance on potential foraging habitat. None of the foreseeable future developments would affect nesting habitat below the rim. Therefore, the cumulative effect of the construction of the employee housing site, in combination with past, present, and other foreseeable future developments, may impact individual peregrine falcons, but is not likely to result in a trend toward federal listing of the falcon as a threatened or endangered species or a loss of species viability.

*Impairment.* The construction of the employee housing facility may impact individual peregrine falcons. There would be no impairment because NPS would not be hindered from fulfilling the purpose of GRCA. Opportunities for enjoyment of GRCA would not be precluded, nor would there be harm to the natural integrity of GRCA. Because there would be no impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* The construction of the employee housing facility and foreseeable future developments would result in modification to suitable peregrine falcon foraging, perching, and roosting habitat, and could potentially disrupt the activities of peregrine falcons known to nest in the area due to excessive noise disturbance. Therefore, the construction of the employee housing facility and foreseeable future developments may impact individual peregrine falcons, but is not likely to result in a trend toward federal listing of the falcon as a threatened or endangered species or a loss of species viability.

## SOILS

### METHODOLOGY

The baseline information used to assess impacts to soil resources is as described in the methodology section at the beginning of this chapter and includes Park staff knowledge of the resources and site; review of existing literature and Park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on natural and cultural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area. Additional sources of information on soil resources used as a basis for this evaluation are as described in the affected environment section.

The thresholds of change for the intensity of an impact on soil resources are defined as follows:

*Negligible* – a change to soil resources that is not measurable or perceptible.

*Minor* – a measurable or perceptible, small, localized change to soil resources. The change is of little consequence.

*Moderate* – a change to soil resources that is measurable and of consequence but is localized.

*Major* – a measurable change to soil resources that is large and/or widespread and could have permanent consequences for the resource.

### **ALTERNATIVE A – NO ACTION**

*Direct/Indirect Impacts.* The no action alternative would not implement any construction activities and therefore, there would be no direct or indirect impacts to soils.

*Cumulative Impacts.* The cumulative impacts (due to past, present, and other foreseeable future development) could consist of minor in intensity, long-term adverse impacts on soil resources due to soil displacement and compaction in some areas to accommodate new buildings and related improvements.

*Impairment.* The no action alternative would have no impacts on soils. There would be no impairment because NPS would not be hindered from fulfilling the purpose of GRCA. Opportunities for enjoyment of GRCA would not be precluded, nor would there be harm to the natural integrity of GRCA. Because there would be no impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* Implementing the no action alternative would have no impacts on soils. The no action alternative in combination with past, present, and other foreseeable future development) could consist of minor in intensity, long-term adverse impacts on soil resources due to soil displacement and compaction in some areas to accommodate new buildings and related improvements.

### **ALTERNATIVE B – PREFERRED**

*Direct/Indirect Impacts.* Construction of the new employee housing facility would impact the soil resource through compaction and soil displacement. Soil properties affected by compaction include soil porosity, water infiltration rates, water holding capacity, and aeration of soils. Approximately 1.2 acres of land would be disturbed. Impacts from compaction would be negligible due to the shallow, coarse, and stone nature of the soils along the South Rim. Surface runoff rates and soil loss due to erosion would be negligible due to the implementation of best management practices, and lack of surface runoff due to evapotranspiration and high permeability of the underlying substrate.

The majority of the soil displacement would occur when the site is cleared and graded for construction. Approximately 2,200 cubic yards of fill material would be imported for the new employee housing site. The direct impacts to the soil resource from the construction of the employee housing facility would be considered as long-term adverse impacts, minor in intensity, due to the removal of the nutrient surface layer and soil profile disruption. Erosion control measures would be implemented to minimize potential impacts during construction. All disturbed areas would be revegetated.

*Cumulative Impacts.* The cumulative impacts (due to past, present, and other foreseeable future development) could consist of long-term adverse impacts, minor in intensity, on soils due to site grading and earthmoving in some areas to accommodate new buildings and related improvements.

*Impairment.* The preferred alternative would have minor, long-term adverse direct and cumulative impacts on soils. There would be no impairment because NPS would not be hindered from fulfilling the purpose of GRCA. Opportunities for enjoyment of GRCA would not be precluded, nor would there be harm to the natural integrity of GRCA. Because there would be no impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's

general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Conclusion.* Implementing the preferred alternative would have adverse long-term impacts, minor in intensity, on soils due to soil displacement and compaction. The construction of the new employee housing facility in combination with past, present, and other foreseeable future development could consist of long-term adverse impacts, minor in intensity, on soils due to site grading and earthmoving in some areas to accommodate new buildings and related improvements.

## Cultural Resources

### ALTERNATIVE A – NO ACTION

*Direct/Indirect Impacts.* The no action alternative would involve no construction and would continue current NPS management actions for the Grand Canyon area. This alternative would have no direct or indirect impact on cultural resources including identified archeological, ethnographic, and historic resources and landscapes.

*Cumulative Impacts.* Archaeological, historical, and ethnographic resources and landscapes have sustained adverse effects from previous road construction and other development activities. Loss or disturbance of these resources due to foreseeable future development (in conjunction with previous losses and prevailing threats to finite numbers of sites throughout the region) could incrementally diminish the overall understanding of Grand Canyon's cultural history, particularly with regard to prehistoric Ancestral Puebloan people, and more recent Native American use of the area. Increasing visitor use and other foreseeable development at Grand Canyon Village poses a long-term moderate risk that archeological, historical, or ethnographic resources may be disturbed or diminished without an adequate increase in GRCA staff's ability to monitor resource conditions, effectively manage visitor use, and implement measures to abate impacts. Steps should be taken to preclude or minimize loss or disturbance of cultural resources as part of any other foreseeable future development, so that any long-term cumulative impacts would be moderate. Cumulative impacts as result of implementing the no action alternative, combined with other past, present, and reasonably foreseeable future projects, would have an adverse cumulative long-term impact of moderate intensity on archeological, historical, or ethnographic resources and landscapes.

*Impairment.* This alternative would have no direct or indirect impacts and the potential for a long-term, moderate adverse cumulative impact on cultural resources. These moderate impacts would not constitute impairment because they would not prevent NPS from fulfilling the purpose GRCA or preclude the opportunities for enjoyment of GRCA. In addition, these moderate impacts would not harm the cultural integrity of GRCA. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of the GRCA's resources or values.

*Section 106 Summary.* In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR 800) implementing Section 106 of the National Historic Preservation Act, the no action alternative would have no effect on historic properties.

*Conclusion.* There are expected to be no direct or indirect effects on cultural resources as a consequence of the continuation of current NPS management actions and policies for the area. Increasing visitor use and other foreseeable development at Grand Canyon Village, however, pose a long-term, moderate intensity, adverse impact that archeological, historic, or ethnographic resources and landscapes may be disturbed or diminished without an adequate increase in GRCA staff's ability to monitor resource conditions, effectively manage visitor

use, and implement measures to abate impacts. Steps should be taken to preclude or minimize loss or disturbance of cultural resources as part of any other foreseeable future development so that any long-term cumulative impacts would be minor.

## **ALTERNATIVE B – PREFERRED**

*Direct Impacts.* Surveys for archeological resources within the area of proposed construction at the employee housing site has been conducted. No significant cultural resource sites were identified within the limits of the site. Therefore, there would be no direct impact to cultural resources.

No sites of special ethnographic significance to Native Americans are known to exist within the bounds of the employee housing site. Consultation with Native American tribal communities would continue to take place to determine whether any previously unknown ethnographic sites would be disturbed by the proposed activities. Measures to mitigate the impact of the proposed work would be taken as necessary in consultation with the interested tribe, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation, as stipulated in 36 CFR Part 800. The locations of sacred sites and other important ethnographic resources would be maintained as fully confidential.

*Indirect Impacts.* At the employee housing site, AZ B:16:105, a Cohonina habitation site, may be indirectly impacted by the project. The prehistoric site is already experiencing impact from human activity. The field assessment of the site has been completed and recommendations on the NRHP eligibility are soon to be forwarded to SHPO for concurrence.

*Cumulative Impacts.* Archaeological and ethnographic resources have sustained adverse effects from previous development activities with Grand Canyon Village. Loss or disturbance of these resources due to foreseeable future development (in conjunction with previous losses and prevailing threats to finite numbers of sites throughout the region) could incrementally diminish the overall understanding of the Grand Canyon's cultural history, particularly with regard to prehistoric people, and more recent Native American use of the area. Increasing visitor use and other foreseeable development at Grand Canyon Village pose a long-term moderate risk that archeological or ethnographic resources may be disturbed or diminished without an adequate increase in the GRCA staff's ability to monitor resource conditions, effectively manage visitor use, and implement measures to abate impacts. These other foreseeable developments also have the potential to compromise the district/landmark's architectural integrity to a minor degree or to visually alter the district/landmark's historic setting as a result of new construction. NPS would avoid or mitigate potential adverse impacts by ensuring that new construction adheres to appropriate design guidelines, and that preservation maintenance and/or more comprehensive rehabilitation are carried out in conformance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (1995). Steps should be taken to preclude or minimize loss or disturbance of cultural resources as part of any other foreseeable future development, so that any long-term cumulative impacts would be minor.

*Impairment.* The construction of the employee housing facility would have moderate impacts on cultural resources. These impacts would not constitute impairment because they would not prevent NPS from fulfilling the purpose of GRCA or preclude the opportunities for enjoyment of GRCA. In addition, these moderate impacts would not harm the cultural integrity of GRCA. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of GRCA, 2) key to the natural or cultural integrity of GRCA or to opportunities for enjoyment of GRCA, or 3) identified as a goal in GRCA's general management plan or other relevant NPS planning documents, there would be no impairment of GRCA's resources or values.

*Section 106 Summary.* There may be impacts to a known archeological resource with the construction of the employee housing facility. After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, *Assessments of Adverse Effects*), NPS concludes that implementation of the employee

housing facility would have an affect and that affect would be considered adverse on one prehistoric property. NPS would follow the programmatic agreement signed by the NPS, the Arizona State Historic Preservation Officer, the Advisory Council on Historic Preservation, and various interested Native American tribes for the implementation of the GMP. The programmatic agreement ensures that NPS would implement all stipulations for the individual undertakings as identified in the GMP according to Sections 106 and 110 of the Historic Preservation Act.

*Conclusion.* There are expected to be direct and indirect effects on cultural resources as a consequence of the continuation of current NPS management actions and policies for the area. Increasing visitor use and other foreseeable development at Grand Canyon Village, however, pose a long-term moderate risk that archeological or ethnographic resources may be disturbed or diminished. Steps would be taken to preclude or minimize loss or disturbance of cultural resources as part of any other foreseeable future development, so that any long-term cumulative impacts would be minor. Indirect, direct, and cumulative impacts of construction of the preferred alternative would be moderate to minor with the appropriate implementation of the mitigation measures.

## **5 Consultation and Coordination**

### **Consultation**

The following organizations and agencies were contacted for information or assisted in identifying important issues, developing alternatives, or analyzing impacts.

#### **U.S. Fish and Wildlife Service**

In conjunction with this and other concurrent compliance efforts, NPS contacted the USFWS to discuss listed endangered, threatened, and species of concern. USFWS provided a list of species of concern through a letter dated August 13, 2001. A 'batch' Biological Evaluation has been submitted to the USFWS for concurrence with the NPS's determination that the proposed action may affect, but is not likely to adversely affect the Mexican spotted owl and the California condor, and a no affect on the Southwestern willow flycatcher. The USFWS concurs with the batch Biological Evaluation with stipulations that specific mitigation measures must be applied.

#### **State Historic Preservation Officer (SHPO)**

In conjunction with this and other concurrent compliance efforts, NPS contacted SHPO to discuss effects to historic properties including cultural landscapes, ethnographic resources, and archeological sites. This EA/AEF contains an Assessment of Effect for review, comments, and concurrence by SHPO with the NPS's determination of potentially adverse effects to one archeological resource. Mitigation plans will be prepared and implemented prior to construction.

#### **Tribal Consultation**

In a scoping letter dated July 23, 2001, all affiliated tribes were notified of the employee housing facilities. Verbal consultation has occurred with GRCA cultural resource staff and interested tribes. This EA/AEF will provide interested tribes the opportunity to discuss any issues of concern with GRCA.

## **Consultants**

### **National Park Service, GRCA**

Sara J. White, Chief Environmental Compliance Officer  
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Elaine Leslie, Wildlife Biologist  
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## **EA Distribution**

The following groups received a hard copy of the EA for a 30 day public review comment period. The EA was also sent to the nine members of the general public who requested hardcopies. The public scoping letter, the letter announcing the availability of the EA and the EA are posted on the GRCA website at <http://www.nps.gov/grca/compliance>.

Arizona Game and Fish Department, Phoenix Office

Arizona Game and Fish Department, Flagstaff Office

Sedona Public Library

Washington County Library, St. George, Utah

Fredonia Public Library

Flagstaff Public Library

Grand Canyon Community Library  
Phoenix Public Library  
Williams Public Library  
Northern Arizona University, Cline Library  
Kanab City Library  
US Fish and Wildlife Service, Phoenix Office  
US Fish and Wildlife Service, Flagstaff Office  
Navajo Nation  
Hopi Tribe

## **Selected References**

### **Executive Orders**

Executive Order 11988 (Floodplain Management)  
Executive Order 11990 (Wetlands)  
Executive Order 12898 (Environmental Justice)  
Executive Order 13112 (Invasive Species)

### **NPS Director's Orders**

DO-12 Conservation Planning, Environmental Impact Analysis and Decision Making  
DO-28 Cultural Resource Management  
DO-65 Explosives Use and Blasting Safety

### **US Federal Employee and State Employee**

36 CFR, Part 800  
1916 National Park Service Organic Act  
1963 Clean Air Act, as amended  
1964 Wilderness Act  
1966 National Historic Preservation Act  
1968 Architectural Barriers Act  
1969 National Environmental Policy Act (NEPA)  
1970 General Authorities Act  
1972 Federal Water Pollution Control Act (Clean Water Act of 1972)  
1973 Endangered Species Act, as amended  
1973 Rehabilitation Act  
1978 Redwood National Park Act  
1979 Archeological Resources Protection Act  
1984 Uniform Federal Accessibility Standards  
1990 Native American Graves Protection and Repatriation Act  
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## **Appendix A – Vicinity Maps**

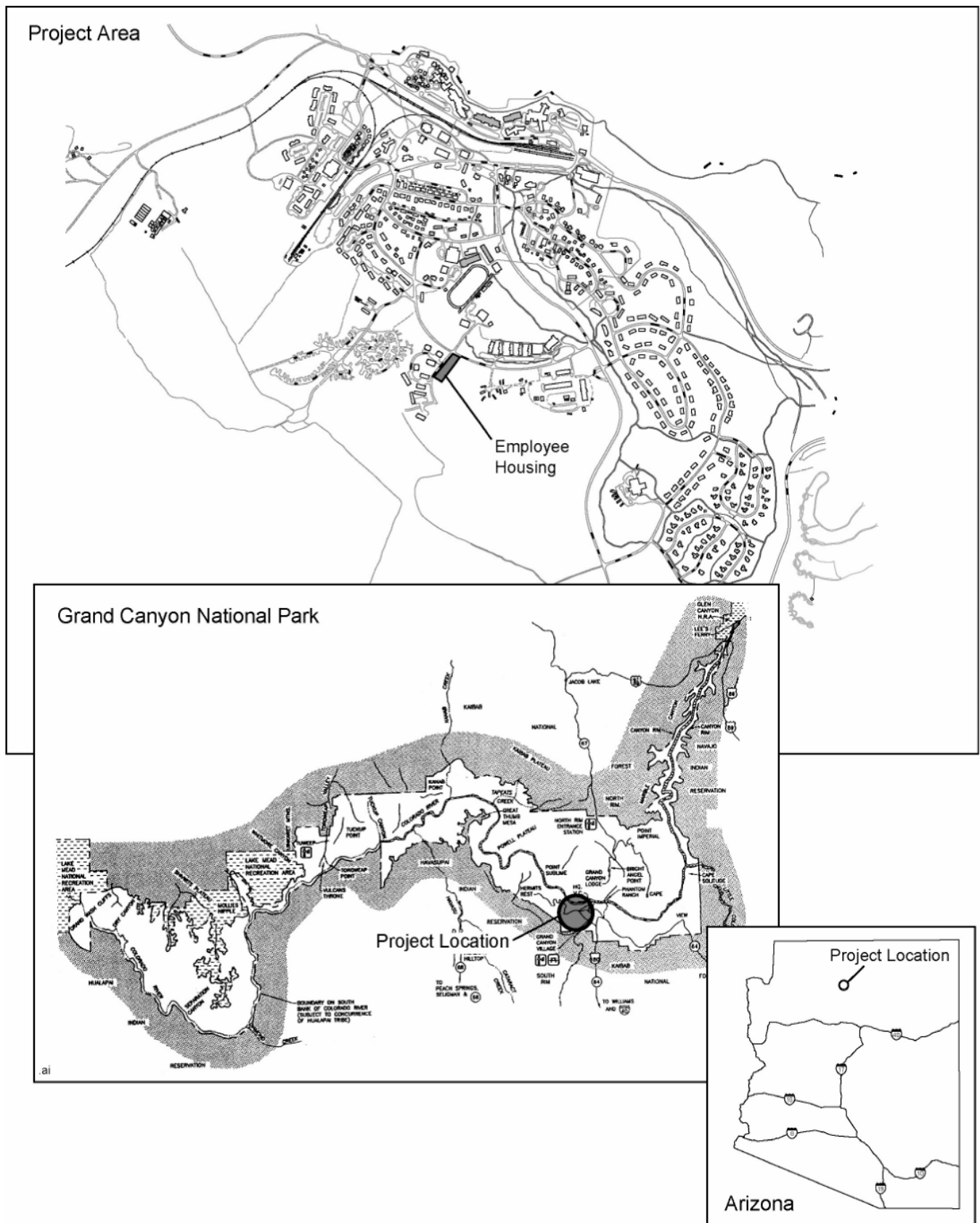
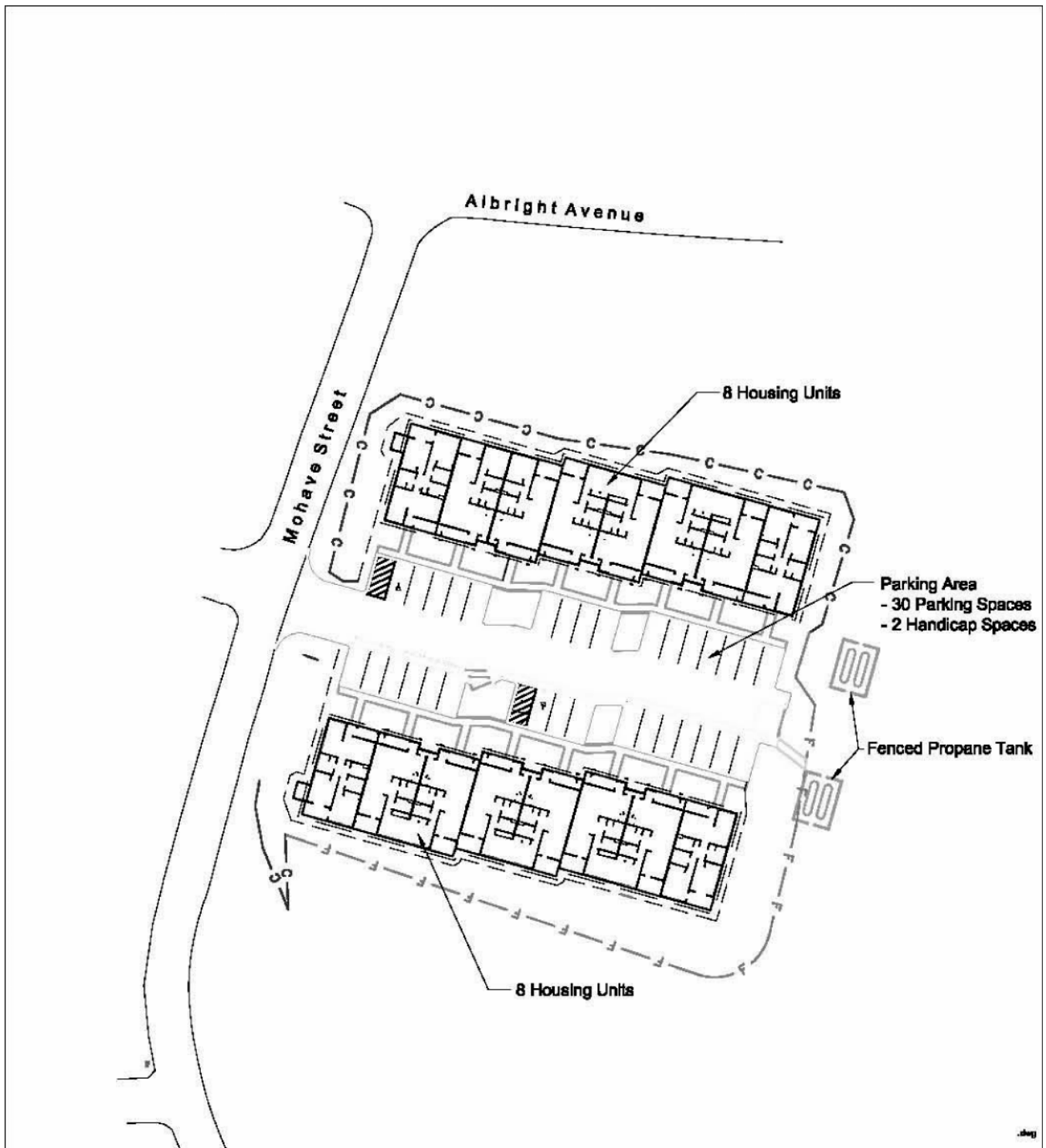


Figure A-1  
Project Vicinity Maps



### Key

- C — Cut Slope
- F — Fill Slope

**Figure A-2**  
**Employee Housing Site Plan**



## Appendix B – US Fish and Wildlife Correspondence and Threatened, Endangered, and Species of Concern

### Threatened, Endangered, and Species of Concern

**Plants:** The U.S. Fish and Wildlife Service has determined that eight federally listed proposed threatened, or endangered plant species may occur or have habitat in the Grand Canyon area:

- Brady pincushion cactus (*Pediocactus bradyi*) – endangered.
- Sentry milk-vetch (*Astragalus cremnophylax* var. *cremnophylax*) – endangered.
- Navajo sedge (*Carex specuicola*) – threatened.
- San Francisco peaks groundsel (*Senecio franciscanus*) – threatened.
- Siler pincushion cactus (*Pediocactus sileri*) – threatened.
- Welsh’s milkweed (*Asclepias welshii*) – threatened.
- Arizona bugbane (*Cimicifuga arizonica*) – candidate.
- Fickeisen pincushion cactus (*Pediocactus peeblesianus* var. *fickeiseniae*) – candidate.

In addition to the federally listed species, the NPS must consider state listed special status species. The Arizona Game and Fish Department has listed the following plant species for consideration for projects occurring on the South Rim.

- Bigelow onion (*Alium bigelovii*) – salvage restricted.
- Grand Canyon primrose (*Primula specuicola*) – salvage restricted.
- Grand Canyon rose (*Rosa stellata* spp. *Abyssa*) – salvage restricted.
- Mogollon columbine (*Aquilegia desertorum*) – salvage restricted.
- Sentry milk-vetch (*Astragalus cremnophylax* var. *cremnophylax*) – highly safeguarded.
- Tusayan flame flower (*Talinum validulum*) – salvage restricted.
- Western fairy slipper (*Calypso bulbosa*) – salvage restricted.

**Wildlife:** In addition to the Mexican spotted owl and California condor, the U.S. Fish and Wildlife Service has listed eight other species as proposed, threatened, or endangered wildlife species that may occur or have habitat in the Grand Canyon area:

- Kanab ambersnail (*Oxyloma haydeni kanabensis*) – endangered.
- Black-footed ferret (*Mustela nigripes*) – endangered.
- Humpback chub (*Gila cypha*) – endangered.
- Razorback sucker (*Xyrauchen texanus*) – endangered.
- Southwestern willow flycatcher (*Empidonax traillii extimus*) – endangered.
- Little Colorado spinedace (*Lepidomeda vittata*) – threatened.
- Bald eagle (*Haliaeetus leucocephalus*) – threatened.
- Chiricahua leopard frog (*Rana chiricahuensis*) – candidate.

In addition to the Mexican spotted owl and American peregrine falcon, the Arizona Game and Fish Department has listed the following wildlife species for consideration for projects occurring on the South Rim.

- Humpback chub (*Gila cypha*) – wildlife of special concern.
- Northern goshawk (*Acipiter gentilis*) – wildlife of special concern.
- Southwestern willow flycatcher (*Empidonax traillii extimus*) – wildlife of special concern.
- Western red bat (*Lasiurus blossevillii*) – wildlife of special concern.

## Appendix C – Exotic Vegetation and Noxious Weeds, Grand Canyon, South Rim

### Exotic Vegetation and Noxious Weeds, Employee Housing, Grand Canyon, South Rim

#### Top five high priority species:

Scientific Name	Common Name	Present on Site	Present within 50 m of Site
<i>Acroptilon repens</i>	Russian knapweed		
<i>Cardaria draba</i>	Whitetop, hoary cress		
<i>Conium maculatum</i>	Poison hemlock		
<i>Linaria dalmatica</i>	Dalmatian toadflax		
<i>Onopordum acanthium</i>	Scotch thistle		

#### Additional Species of Concern:

Scientific Name	Common Name	Present on Site	Present within 50 m of Site
<i>Aegilops cylindrica</i>	Jointed goatgrass		X
<i>Agrostis stolonifera</i>	Redtop, bentgrass		
<i>Bromus tectorum</i>	Cheatgrass	X	X
<i>Bromus inermis</i>	Smooth brome		X
<i>Centaurea maculosa</i>	Spotted knapweed		X
<i>Centaurea diffusa</i>	Diffuse knapweed		
<i>Centaurea virgata</i>	Squarrose knapweed		
<i>Chondrilla juncea</i>	Rush skeletonweed		
<i>Conyza Canadensis</i>	Horseweed		
<i>Convolvulus arvensis</i>	Field bindweed		X
<i>Dactylis glomerata</i>	Orchardgrass		
<i>Elymus repens</i>	Quackgrass		
<i>Erodium cicutarium</i>	Filaree		X
<i>Hordeum murinum</i>	Rabbit barley		
<i>Marrubium vulgare</i>	Horehound		X
<i>Poa pratensis</i>	Kentucky bluegrass		
<i>Salvia aethiopis</i>	Mediterranean sage		X
<i>Sonchus asper</i>	Spiny sow-thistle		
<i>Sorghum halapense</i>	Johnson grass		
<i>Tribulus terrestris</i>	Puncturevine		

#### Species not yet documented on South Rim, but spreading on surrounding lands:

Scientific Name	Common Name	Present on Site
<i>Alhagi maurorum</i>	Camelthorn	

<i>Centaurea solstitialis</i>	Yellow star thistle	
<i>Cynoglossum officinale</i>	Houndstongue	



## **Appendix D – Definitions of Construction Activities**

The following definitions of construction activities is from the Grand Canyon National Park Parkwide Construction Program Biological Assessment, June 2002.

### **Heavy Construction**

Heavy construction would require the use of large equipment for actions such as earthmoving, rock excavating, and building construction.

1. Earthmoving: Earthmoving activities would require the use of heavy equipment such as large bulldozers, scrapers and excavators for moving large areas of soil and rocks. This activity would be typical of construction of large facilities or roads where large areas of cut and fill would be manipulated (these are rare situations).
2. Rock excavation, including trenching (does not include blasting): Work involving rock excavating and trenching would typically require the use of heavy equipment such as hoe-rams, rock saws, hammer hoes, rippers on bulldozers, and large trackhoes with hydraulic hammers. This type of activity would be used for utility lines and foundations where rock is present. The operation of the equipment necessary to excavate rock can be very loud and can also result in vibration. The sound generated from the rock excavation itself can also be very loud.
3. Building Construction over three stories: Work involving construction of tall buildings, typically over three stories may require the use of a large crane over 100 feet high. This would be an impact to the surrounding landscape, for the time that the building was being constructed.

### **Light Construction**

Light construction is defined as those construction activities that are not described above for heavy construction. Typically light construction activities would require smaller pieces of equipment that do not typically generate as much noise as those activities listed for heavy construction. Light construction would include such activities as road rehabilitation and maintenance that does not require the use of heavy earthmoving equipment, trenching in dirt (not rock), concrete work, earthwork that does not involve heavy earthmoving equipment, trail construction (if it does not require the use of heavy earthmoving equipment or rock excavation), and building construction of two stories or less (that would not require a crane). Typical equipment that would be used for these types of activities include backhoes, small dump trucks, chainsaws, jackhammers, small bulldozers, bobcats, pavers, small base/soil compactors, punjars and graders. Blasting, the use of large earthmoving equipment, and the use of very loud equipment (like rocksaws and hoe rams) would not be used during light construction activities.

### **Blasting**

In general the purpose of blasting is to fracture materials so that they can be more easily excavated or removed. Blasting is done in two primary ways: 1) uncontained blasting, where materials may be ejected from the immediate area, such as is often done for mining purposes; and 2) contained blasting, which occurs underground and where material is not ejected from the blast site. This second type of blasting is the most common type used in national parks. This type of blasting is considered an option for projects where deemed necessary and appropriate. This type of blasting would typically result in a muffled roar and ground vibration. Typically, the contractor would drill to the depth of the excavation in a grid pattern, insert the proper amount of explosive for the depth desired, and then provide a protective cover (blasting mat or earth fill) over the area of the blast. When the blast occurs, the ground would rise slightly in the area, then return to about ground level. The desired excavation limits would be developed by the blast and a backhoe or shovel would be used to remove the material. The result is typically a neat, clean excavation in the rock.

Blasting is usually only permitted by NPS if other tools are impractical, or as a last resort. NPS will restrict blasting for a variety of reasons such as proximity to visitor/employee areas, proximity to other structures, proximity to sensitive resources, etc. Blasting would only be used for a project when it is considered the best tool for the job by the contractor and is permitted by NPS. A blast could be loud, but would last less only milliseconds. All blasting would be conducted in accordance with Director's Order 65 (Explosives Use and Blasting Safety) and a blasting safety plan would be developed prior to implementation.